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LAKE FREIGHT SITUATION.

Vessel owners who refused 75-cent ore contracts from the United States Steel Corporation and from other shippers who have tried to establish that rate for the coming season are even more determined in their position than they were a few weeks ago, as the prospects of a very heavy business in all iron and steel lines during the coming year seem to grow from day to day. There is, therefore, no immediate prospect of more ore freight contracts being made. It is the general belief now that the action of officials of the Steel Corporation in announcing their intention not to pay more than 75 cents was not based upon opposition to an 80-cent rate if the same was generally paid. They wanted to be assured this year against other shippers getting vessels at less than 80 cents, and failing in this they are said to be simply deferring action in the matter of taking such vessel capacity as they will need outside of their own fleet. Thus the vessel owners are inclined to the opinion that their chances of eventually getting 80 cents on all contracts are better than they would be if the difference of 5 cents, compared with last year, was a point of first importance with the big organization. Last year, after the Steel Corporation had covered a very large amount of ore at 80 cents, M. A. Hanna & Co. succeeded in making contracts at 75 cents, and by moving early in the season the bulk of ore for which they had no contracts, their average rate was undoubtedly reduced to a figure considerably below that of the Steel Corporation. This action also forced the big organization to maintain an 80-cent rate on wild charters, even in the summer months. So it will be seen that the question of making the rate 75 or 80 cents involves differences between shippers as much so as between vessel owners and shippers.

Delay in closing up ore freight contracts naturally has an effect upon negotiations for the movement of soft coal. Quite a large amount of coal could probably be readily covered by lake freight contracts if the ore situation was entirely settled. Two or three of the coal shippers who have tried within the past few days to figure with the vessel owners on contracts for coal to go to the head of Lake Superior have been told that the rate is to be 40 cents, and to Milwaukee 50 cents. Last year a few small blocks of coal for the head of the lakes were covered at 40 cents, but nearly a million tons was taken at 35 cents. The average rates on coal paid to vessels chartered from trip to trip (average of daily rates) have been: To Duluth—In 1901, 38.3 cents; in 1900, 40.2 cents; in 1899, 45.4 cents. To Milwaukee—In 1901, 48.9 cents; in 1900, 45.4 cents; in 1899, 68.9 cents.

INDUSTRIAL ACTIVITY IN CANADA.

All signs seem to point to something of tremendous import taking place in Canada. It is stated at Montreal that a great financial and railway enterprise is concealed behind the recent activity in the stock of the Dominion Iron & Steel Co. and the Dominion Coal Co. Although the coal stocks have never paid a dividend the common stock is selling at par. Mr. James Ross, who is now practically in control of the Dominion Iron & Steel Co., is buying all the coal stock that is offered. It is understood that the Canadian Pacific Railway Co. is behind Mr. Ross. The Canadian Pacific has just made arrangements to issue \$20,000,000 worth of additional stock. The Dominion Iron & Steel Co. has just announced an issue of \$10,000,000 additional stock. This \$30,000,000 has already been underwritten. A Montreal correspondent writes:

"It is an open secret that the consummation of this scheme will remove a last objection to the Canadian Pacific being entrusted with the providing of the fast Atlantic line between Canada and Europe. With the acquisition of the coal and steel properties the Canadian Pacific will be able to provide coal for its steamships, steel and iron for the large locomotive and car shops which it is about to erect in Montreal, as well as rails for its entire system. Upon the consummation of this transaction the Canadian Pacific will have a line of steamships from Europe to Canada; a line of railway from the Atlantic to the Pacific, and another line of steamships from British Columbia to China. Thus practically girdling one-third of the earth, providing their own raw material for the manufacture of steamships, locomotives and cars, and furnishing their own coal, by reason of the control of the Sydney, Lethbridge and Crows' Nest lines, for the locomotives along the entire route of railway."

Mr. James Ross, the managing director of the Dominion Iron & Steel Co., has made the following statement concerning the company:

"There is a heavy demand for steel, both in Canada and the United States, and we can make more money today in selling our billets than if we had our mill in full running order and turning out steel rails. I do not believe, therefore, that we will have any difficulty in selling our entire product this year in the shape of billets. This, however, does not indicate the slightest modification in our policy of manufacturing rails, as the mill is being pushed rapidly forward. The main building is well under way, as the weather in Sydney this winter has been most favorable for construction. We have, in fact, contemplated the erection of a hand mill, so as to be able to turn out rails at an earlier date, but we found that such rapid headway was being made on the larger enterprise that such an alternative was uncalled for. Since I left Sydney I have received most satisfactory reports as to the progress of the enterprise, all of which have been presented to the board; but the most important matter we had to discuss was the question of our financial policy. In order to operate successfully the steel company, it is necessary to have on hand a very large amount of material, our last balance sheet showing a value of \$2,500,000. Acting, therefore, upon the experience gained with the coal company, the board favors the policy of keeping well in funds for the company's effective operation, in order not to be obliged to go to the banks to borrow large sums on capital account, the interest on which is heavy, and also compounded, as is the case in such loans. In my opinion the com-

pany would be much stronger and sooner placed on a dividend paying basis if such a policy could be carried out. The Canadian banks have not been accustomed to loaning such large sums to manufacturing concerns, but, of course, as business increases and the financial institutions of the land become used to such transactions, the conditions will be changed. In order to afford a remedy the board decided to call upon our partners, the stockholders, to subscribe another issue to common stock to provide for such demands. Some legislation will be necessary, but I am sure the Nova Scotia legislature, feeling, as it does, that the prosperity of that province is bound up in the success of the coal and steel industries, will be only too willing to offer every facility for the effective carrying out of our policy."

SHIP BUILDING AT NEWPORT NEWS.

Newport News, Va., March 5.—The Pacific Mail Line steamship Korea, the largest vessel built in this country up to this time, was floated out of dry dock Monday and has given a satisfactory dock trial. On March 20 this steamer will leave the ship yard on her builder's trial and it is understood that she will remain at sea for about forty-eight hours. The vessel will be taken some distance out on the ocean for the purpose of properly testing her qualities. It is expected that the Korea will be ready to leave the ship yard by April 10 for San Francisco, probably via New York. The official measurements of the ship have been completed and it is shown that her gross tonnage is 11,276 and her net tonnage 5,651, with a displacement of 18,600 tons. The measurements for gross tonnage were made last summer, but were not completed. They were finished last week and the measurements for deduction for net tonnage were made, the work being done by Customs Inspectors Vaiden, Turner and Hundley, assisted by F. F. Egan of Philadelphia, the government expert.

The Newport News Ship Building & Dry Dock Co. has just been awarded the contract for a lumber freight steamship, which will ply in the Pacific coast trade, probably out of Vancouver, B. C. Details regarding the owners of the vessel and her construction seem to be lacking here, the resident officials knowing very little about the matter, other than that the contract has been let and that work will begin immediately. The ship will be about 250 ft. in length and will be designed specially for lumber carrying. It is stated that the vessel must be completed inside of ten months.

Next Tuesday the new steamer Berkley for the Old Dominion line will be launched at the ship yard of the Wm. R. Trigg Co., Richmond. This vessel is a sister ship of the Brandon, recently turned out by the Harlan & Hollingsworth Co. at Wilmington, and now on the James river route between Norfolk, Newport News and Richmond. One of the new revenue cutters building for the government will also be launched at the Trigg yard this month.

The civil engineer force of the navy yard is engaged in making surveys of the site for the new wharf on the property recently purchased by the government at St. Helena. The monitor Puritan, which is undergoing an extensive overhauling at the navy yard, will be ready to leave in a few days for Annapolis, her regular station.

When the steamship St. Enoch sailed from this port last week she carried a cargo of the finest lot of export cattle ever shipped through this city. The stock goes to South Africa for breeding purposes. Aboard the steamer is J. W. Searle, principal importing agent for the Armours, who is probably the most noted man in his line of business in the country. "This is destined to be the greatest cattle exporting port in the United States," he stated in an interview. "You have everything here to make it so. The climate is exactly suited to this business, and this is the great thing that importers and exporters have to contend with. The cold weather of the northern ports kills the cattle and entails heavy losses, and the extreme warm weather of the southern ports is equally as deadly. Here, however, the climate is not so changeable and the result will be just as I predict—that in the near future this port will be doing more business in this line than any other port in the country." Already Newport News' cattle shipments abroad are quite heavy, outstripping many of the larger ports.

MANCHESTER SHIP CANAL.

The half yearly report of the Manchester Ship Canal Co. shows that that corporation is still struggling. It is engaged in reducing the interest charges on its debt to the Manchester corporation. The expenditure on capital account for the past six months amounted to £281,865; but as the proceeds of sales of land and plant and other receipts were £1,262, the net outlay was brought down to £280,603. This carried the total expenditure on capital account to £15,173,402, leaving a balance to credit of £280,997. The ship canal revenue receipts amounted to £163,008, and the expenditure to £102,980, leaving a credit balance of £60,028. The profits of the Bridgewater canal department were £11,189. The balance to net revenue account was, therefore, £71,217, to which was added £5,379 for bankers and general interest, making a total profit on the half-year's work of £76,596. After paying interest on sundry debentures, there was a balance remaining of £30,854 for the Manchester city council on account of the interest due on debentures which it holds. The weight of toll-paying merchandise which passed through the canal during the past six months was: Sea-borne traffic, 1,422,089 tons, as compared with 1,437,692 tons in the corresponding six months of 1900; barge traffic, 129,155 tons, as compared with 134,983 tons. The receipts showed an increase of £13,525 as compared with the previous year, and there was a decrease of £4,154 in the expenditure. The decrease in last half year's sea-borne traffic was more than accounted for by diminished coal shipments. The Bridgewater canal traffic suffered from prolonged drought. No portion of the system had to be closed, but the decreased depth prevented boats carrying full loads.

EXTENSIVE ORE DOCK IMPROVEMENTS.

ANOTHER PERIOD OF RADICAL CHANGE IN MACHINERY FOR UNLOADING ORE FROM SHIPS—AUTOMATIC UNLOADERS WILL SOON BE OPERATED IN GREAT NUMBERS ON LAKE ERIE DOCKS—MORE SUBSTANTIAL FORM OF DOCK CONSTRUCTION.

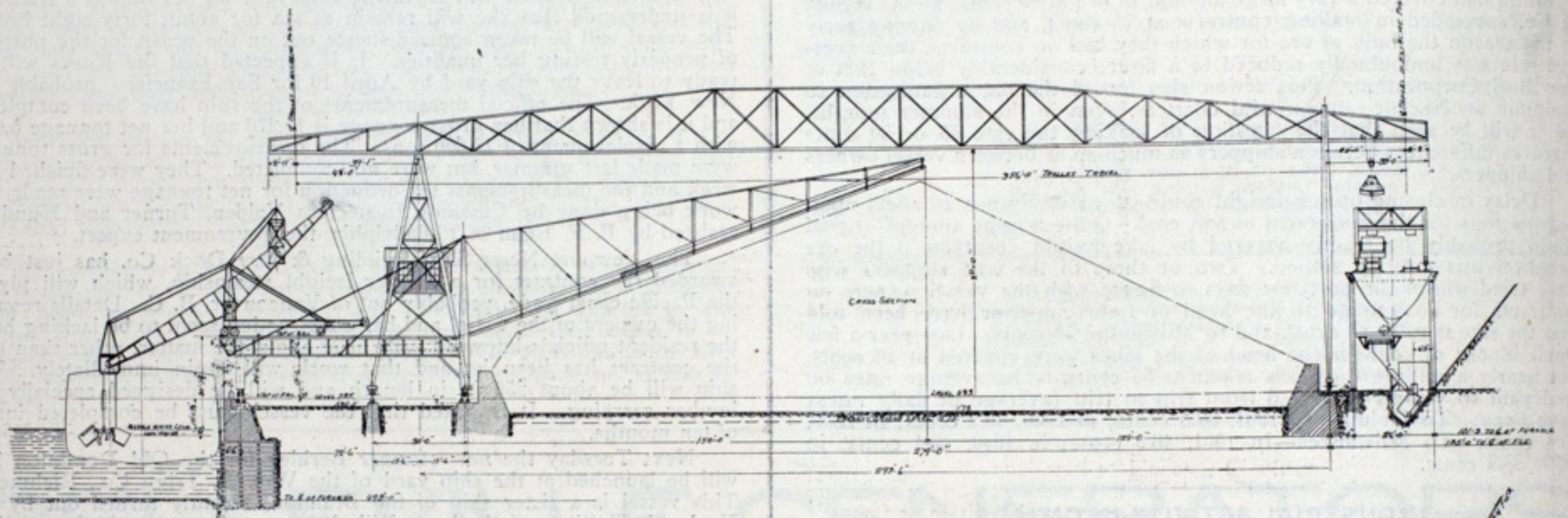
It is little more than fifteen years since wheel barrows and wooden buckets, the latter hoisted by rope attachments to horses, were used quite generally on the iron ore docks of the great lakes in unloading vessels. The development of hoisting and conveying machinery in this industry has since attracted the attention of the world. But great gangs of men are still employed in the holds of vessels shoveling the ore into buckets that are moved and dumped automatically into railway cars or onto stock piles. Thus the mechanical operations attending the discharge of the ore once it is loaded into the buckets has reached a wonderful stage of perfection, while there has been no special progress in overcoming the element of manual labor involved in the holds of the ships. It is now more than probable, however, that the next two years will witness a wonderful change on this score. It will take some time to build the machines and improve their operation over experimental plants that have already been on trial, but another period of radical changes in the method of transferring ore from ships to docks and to railway cars is certainly at hand. Not much can be accomplished in the season of navigation that will soon open, as the several types of new machines must still be experimented with, but it is not a rash prediction to say that in 1904 full 50 per cent.

dumped, from the clam-shell unloader up the inclined tracks of the cantilever extension; two 150 H.P. motors for raising and lowering the walking beam, carrying the clam-shell bucket; two 50 H.P. motors for moving the trolley supporting the walking beam in and out over the boat; one 50 H.P. motor, operating an air compressor; one electrically-driven pump that supplies water under 800 lbs. pressure for rotating and closing the clam-shell hoist. This pressure is maintained by air intensifier.

The bucket is of a new design, arranged by the action of one hydraulic cylinder to open and close and also having a horizontal movement by which the ore can be drawn out from under the deck of the boat and the bucket then closed. This bucket has a capacity of ten gross tons and the machine is designed to make fifty trips per hour. The ore is taken up by this bucket and unloaded into a dump car near the water's edge, the car then being drawn out on the cantilever and dumped on the stock pile. It is expected that from 350 to 400 tons per hour will be unloaded by each machine.

To supply ore to the furnaces that are located back of the ore dock two conveyor bridges are being built, each having a span of about 300 ft., with cantilever extension on each end. These bridges are 80 ft. high to track. Suspended from these bridges by trolleys are 7-ton excavating buckets of a new design that automatically pick up the ore from the stock piles and convey over trestle where it is dumped into bin-filling cars and conveyed to bins. These conveyors are operated by two 130 H.P. motors. It is expected that each conveyor will take from the stock pile 250 to 300 tons of ore per hour.

It is said that if the experimental Hulett automatic machine, which is being installed at Ashtabula by M. A. Hanna & Co., is successful, it



THE UNLOADING EQUIPMENT ON THE LACKAWANNA IRON & STEEL CO.'S DOCKS AT BUFFALO.

of the ore coming to Lake Erie ports will be taken from the ships entirely by machinery.

The great delay of ships at the docks in the past season of navigation, when the output of ore from the Lake Superior region exceeded 20,000,000 tons, has hastened the plans of dock managers, who have been watching for two years past the experimental unloading machines of the Webster, Camp & Lane Co. of Akron (Hulett type) on the Conneaut docks and the machines of Hoover & Mason at South Chicago, and so it is announced that a large plant of the Hoover & Mason kind, now being erected by interests controlling the Angeline and Mahoning & Chenango docks at Ashtabula, is to be in readiness for the coming season; that the large new docks to be erected at Ashtabula by Pickands, Mather & Co. are to be equipped with similar machines and that they will be tried also on the Nypano docks, Cleveland; that M. A. Hanna & Co., on the Pennsylvania side of Ashtabula harbor, are to operate during the coming season on one of their old docks grab buckets of Hulett type and that they are to experiment with one machine of the kind that is entirely automatic, with a view to extensive adoption of it; also that the docks at the new works of Lackawanna Iron & Steel Co., Buffalo, will be equipped with the latest type of Webster, Camp & Lane machine. This new machinery will necessarily require so much time in development that little can be expected in the way of improved Lake Erie dock equipment for the present season, but this branch of the ore industry is hoping for considerable relief from improved railway facilities. At Conneaut, for instance, no dock changes are being made, but officials of the Steel Corporation confidently expect that their railway to Pittsburgh will be so improved in sidings, etc., and the number of cars and locomotives so increased, that they will handle close to 4,000,000 tons of ore at Conneaut this year as against about 3,200,000 tons in 1901. The Webster, Camp & Lane type of automatic unloader originally tried at Lorain and the Hoover & Mason machine first installed at South Chicago are, of course, being very much improved in the plants that are to be erected or which are already under construction at the places above referred to. These machines are the basis upon which the general change is being planned.

A description of the Webster, Camp & Lane plant that is being installed at the new works of the Lackawanna Iron & Steel Co. at Buffalo will prove interesting in connection with this general trend towards automatic unloaders. This plant will consist of three machines for unloading ore from boats and putting it into stock pile on the dock. These machines are of the same general design as the four on the Steel Corporation's (Carnegie) dock at Conneaut except that they are electrically operated and have a cantilever bridge extending back 150 ft. from the rear support, and ore can be piled 80 ft. high. The bottom of the ore pile is about 320 ft. wide and as the docks are to be about 1,800 ft. long this will give an available stocking capacity of about 1,000,000 tons. Machinery for operating these unloaders is as follows: Two 130 H.P. motors for moving the machines along the dock and drawing the self-dumping car, into which the ore is

will be followed by five additional machines of like character. The Hoover & Mason machinery being installed by interests controlling the Angeline and Mahoning & Chenango docks at Ashtabula will involve an expenditure of probably \$225,000 and the new Pickands, Mather & Co. docks will also represent a very large investment. These new docks will have a water frontage of about 1,500 ft. This frontage will be on the main river with the exception of some 600 ft. which will be upon a new slip. On one side of the slip the company will build a coal dock which will be equipped with a car dumping machine. Work will be prosecuted vigorously and both plants will be ready for operation on the opening of navigation, 1903.

In connection with the blast furnace which Pickands, Mather & Co. will build at Toledo, an ore dock will of course also be constructed. Considerable land has been secured in the vicinity of the Craig ship yard and it is expected that the dock will be ready to receive some ore during the coming fall.

The Pennsylvania Railway Co. is building a fast coal plant—car dump machine—for the National Fuel & Dock Co. in the outer harbor at Cleveland. The work is being done by the McMyler Manufacturing Co. of Cleveland. This plant will be ready for operation by the time navigation opens.

At Sandwich, on the Detroit river, the docks of the Pittsburgh Coal Co. will be given a general rebuilding in readiness for the opening of navigation. Two new clam-shell scoops will be put in, the chutes will be repaired and made higher, new tramways will be put in and the channel at the rear of the dock will be deepened and widened. In addition to this sheet piling will be put in all around the dock and it will be so generally improved that the largest class of steamers will be able to make the dock without difficulty.

Improvements in railways from the mines to upper lake shipping docks, and in the shipping docks themselves, are not as badly needed as at the receiving docks, but some activity is also manifested at the mining end of the lake route. At Escanaba the Chicago, Milwaukee & St. Paul Railway is making additions to its dock capacity that will materially increase shipments of last year. At Superior the Eastern Railway of Minnesota is to increase its ore dock capacity by the addition of 100 pockets of 200 tons capacity each, at a cost of about \$250,000, and it is to have 1,000 additional 50-ton cars, as well as additional locomotives. At Two Harbors the Duluth & Iron Range road is to have a new dock at a cost of \$175,000, and at Duluth the Duluth, Mesabi & Northern is improving its facilities by extensive replacement of wood bridges, regrading and improved alignment. At Ashland both the Northwestern and Wisconsin Central roads will make repairs to docks and equipment. The

Algoma Central Railway is also enlarging its dock facilities at Michipicoten on the north shore of Lake Superior.

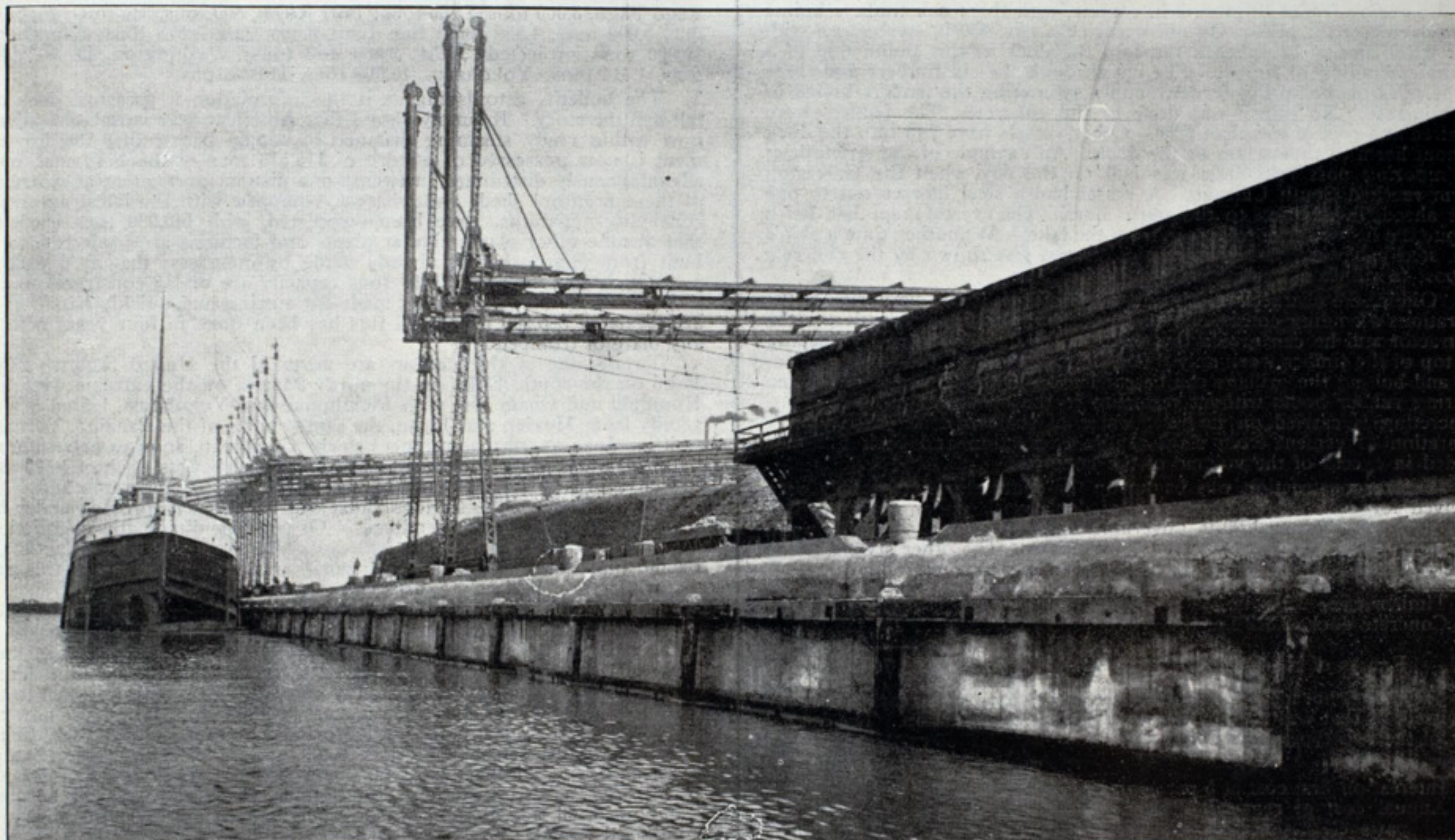
MORE SUBSTANTIAL FORM OF DOCK CONSTRUCTION.

In line with the substantial growth of the ore industry the railway companies and dock companies are also giving thought to the subject of eventually replacing the present form of timber docks with concrete structures, built to withstand the rough usage to which docks of the iron ore trade are subjected. The experience of the Illinois Steel Co. (now a part of the Steel Corporation) in this regard is interesting. The accompanying illustration shows a dock of the concrete kind at the Illinois works, South Chicago. Some information regarding this dock, as well as others of a similar kind at the South Chicago works, is derived from a paper on the subject, prepared by Mr. Victor Windett, engineer of the Illinois Steel Co., who designed these structures. Mr. Windett says:

"This dock, known as the south dock of the north slip, replaced a strong timber dock of pine deck on heavy pine caps and sills, carried on three parallel lines of piles, which in each row were spaced 6 ft. apart along the dock. In 1897 and 1898 a fourth line of piles was added to reinforce the dock. At the water line all were tied together by heavy oak ties and wales and 1¼-in. rods (all timbers being 12x12 in. in section). Back of the piling was a line of double 4-in. oak sheeting, behind which, to prevent washing of sand, was 6-in. pine Wakefield sheeting. The dock was tied back by heavy anchor rods every 6 ft. to either a line of piles or

before the dock was put in use. In the river silt of New Orleans, this resistance amounted to six tons per foot of length of piles. These piles are in an especially favorable position to absorb the strain on the diagonal bolts of the mooring posts. Had these piles been driven battered towards the dock front, i. e., the upper end of driven pile pointing in shore, the most favorable position would have been to have braced the front piles. This was not possible on account of the closeness of approach to the dock of the rectangular box-like hulls of steel vessels. If placed against the second row of piles, the angle of batter would have been so slight as to have been of little utility. Had this objection been overcome by driving them against the third line of piles, a large portion of them would have been in the comparatively loose slag filling where they would be of doubtful value. It is also in favor of the batter piles as driven that they were easily driven from batter leaders temporarily fastened to the leaders of an ordinary floating pile driver. The value of this feature was shown by the fact that these piles were driven for the same price as the ordinary vertical piles.

"Concrete was made of blast furnace slag, as dug by a steam shovel from the slag bank, without further preparation. That portion below the water level was made in the proportions of steel Portland cement one, sand four, slag eight parts. The face was similarly composed in the proportions one, four, four. The backing was made of Utica natural cement one part, sand three, slag five parts. The top was finished with 4 in. of steel Portland, sand, and crushed slag—one, two, two



CONCRETE DOCK AT THE ILLINOIS STEEL CO.'S PLANT AT SOUTH CHICAGO.

a concrete wall, situated 45 ft. back and running from the ground level about 8 ft. down. The width of this wall was 6 ft. The dock was built in the summer and winter of 1890, but after seven years' use, under the heavy service of the iron ore trade, it was dangerously broken in sections and worn out. When the new dock took its place the front row of piles was closed with Norway pine piles. Piles in the second row were driven 2 ft. centers. Back of this stood a new line, in which piles were spaced 3 ft. centers. All the old dock being cut out of the way, the piles were sawed off at a depth of 3½ ft. below Chicago datum. The open spaces between the piles were filled with slag. The front and third rows were tied together by wales and rods every 8 ft. A grillage of 12x12 in. hemlock timbers, composed of longitudinal caps and cross pieces spaced 21-in. centers, was bolted to the piles. The drift bolts stand 9 in. above the grillage. The concrete superstructure is firmly fastened to this timber work by entirely surrounding the grillage timbers and protruding bolts whose heads are upset to give greater area of contact with the concrete. The stability of the dock depends upon four things. These are:

"First—The stiffness of the pile and grillage structure, which is considerable.

"Second—The great weight of the dock, exceeding 10 tons per lineal foot and acting in a vertical direction.

"Third—The strong-back anchors, which are 1¼-in. rods spaced 6 ft. apart, running to a line of piles and anchor timber of oak 36 to 38 ft. back of the dock.

"The fourth source of strength is a row of batter piles, driven 7 ft. apart, running back under the toe of the old sheeting, in a favorable position for resistance. These piles, passing between grillage timbers, rise into the concrete and are firmly bolted to two side pieces of oak, which in turn are drift-bolted to the grillage. While no direct tests of the strength of this style of anchoring are available, it is known that it is extremely difficult to pull a rough pile—entirely below ground and in a stiff clay and with a downward pressure exerted on it—from the superincumbent earth above it, especially after it had ample time to come to rest

parts respectively—one running into the other in 'saw tooth' form, averaging a foot thick. The face had no protection from cold other than the 3-in. pine planking used for the concrete form. During construction, the thermometer fell to 8° and concreting was carried on at temperatures as low as 15°. Expansion joints were provided every 25 ft. At these places the blocks dovetail into each other, to insure permanent uniformity in alignment.

"Cast iron mooring posts, weighing 1,500 lbs. each, are bolted to the grillage by four 2-in. bolts. Additional security is given by diagonal tie-rods running to the anchor piles. Fenders of wales bolted to the concrete and piles are placed in front to take the blow of vessels and distribute them over the mass of the concrete. The fenders form the only part of the dock subject to decay, as all other wood and iron are protected from action of the atmosphere and climatic changes.

"Work was begun on this reconstruction Jan. 3, 1899, by tearing out a portion of the old dock. Concreting began Feb. 17. On May 5 1,428 ft. of the entire 1,608 ft. was completed—in ninety-eight working days. This was at the rate of 15 ft. completed per day. In one day of 10 hours 112 piles were driven, and 170 cut off 3½ ft. below water, the saw being set each time under an engineer's level. In masonry, 143 cubic yards of concrete were placed in 11 hours, and 130 during the following night turn.

"The dock having passed through two summers and parts of three winters shows no sign of the service undergone in the thumping of heavily loaded ore vessels against it, sometimes severe enough to give a strong blow when their headway has not been sufficiently checked before touching the dock fenders. Mooring posts have stood the test of hauling up short vessels coming to a stop. Lines from three vessels have been on a single post at a time. The posts and alignment of the dock remain unchanged. On the land side, within 40 ft. of the dock face, are the rails of the Brown-Hoist conveyors—two standard gauge tracks on which run 180,000-lb. locomotives with 100,000-lbs. capacity cars, and a 3 ft. gauge ore railway. Immediately behind are ore piles rising to a height of 35 ft.

"At the south slip docks the problem in construction was different

from that just described, as it involved the building of a slip as well as the surrounding docks. Building did not go on as rapidly as at the north slip. More time being available, the contractor did not crowd the work, and the dredging of the slip itself being carried on in advance of the dock construction, held the latter back. This work was begun in June, 1899, and finished in March, 1900. The dockage is 2,312 ft. in length. The general features of this work were the same, but there was some improvement in details. The top timbers of the grillage are set back 8 in. This gives an additional depth of a foot for the full face of the concrete, without putting the timber work lower. The material under the grillage being a quick running sand, the joint at the top of the sheeting was sealed by carrying the concrete to a greater depth in front. No trouble was experienced in concreting below water, as was proved by bringing to the surface, after it had set, some of the concrete deposited under water. Concrete was deposited in blocks of a length of about 25 ft. by starting in a corner and rapidly placing material till a little island was made large enough for a man to tamp and then the island was increased by depositing along its edge. In this way no water washing of cement occurred before the setting of the concrete.

"As the mouth of the slip was cut away, to give easy entrance to vessels entering from the river, with which the slip made an angle of 80°, it was exposed to ramming by incoming vessels. The dock work was consequently heavier. Concrete was 18 ft. thick at the base and made entirely of steel Portland cement. Three oak fenders, 12x12 in., were bolted to the dock face, and with a free space of 2 ft. between these, it stood a spring fender of piles, 3-ft. centers, with three oak timbers bolted on each side of the piles. On one occasion a new 450-ft. steel vessel with over 6,000 tons of ore aboard ran into the dock at this point, due to a misunderstanding of signals. She cut through the six timbers and three of the piles of the spring fender, simply splintering the fenders bolted to the concrete. No injury was done to the concrete. The fenders were repaired at a cost of less than \$250. Other vessels have run into the dock without harm to themselves or the dock. An example of the strength of the mooring post fastenings was had on the day when the Galveston storm reached South Chicago. A vessel had a steel hawser out to one post ahead, in addition to the stern lines. The vessel kept her berth despite the heavy surge rolling in from the lake. At another time a ship's 1-in. steel cable parted, but no sign of distress was shown by the concrete or post to which it was attached.

"One of the characteristic features of the dock is the simplicity of the operations attending construction. Hence, building is inexpensive to the contractor and he can give a low price to the dock owner. By keeping the top of the timber work only 2 ft. below water level, the work of placing and bolting the grillage can be carried on in the winter time by men wearing rubber boots without resorting to the construction of caissons. Concreting is carried on in quiet water of shallow depth without any separation of cement from slag. Little excavation and back filling is needed in excess of the volume of the concrete.

"Before construction was begun on the south slip sixteen bids were received for each of the two styles of dock work under consideration. One style was the usual 20-ft. government timber crib filled with rip-rap and somewhat modified to suit local conditions. The other style was the concrete dock. The average of these bids gave results as follows:

Timber crib, 2,312 lin. ft.	\$96.07	\$222,113 84
Concrete dock, 2,312 lin. ft.	65.50	151,436 00

Excess of the timber crib.....\$ 70,677 84

"This does not include the dredging required for the excavation of the slip itself, as that was not charged to the dock construction. The annual cost of the two types is as follows:

	Timber.	Concrete.
Interest on first cost at 5 per cent.....	\$11,105 69	\$ 7,571 80
Annual cost of renewal of destructible parts	7,514 00	2,751 28
Total, timber.....	\$18,619 69	\$10,323 08
Concrete	10,323 08	
Difference	\$ 8,296 61	
Difference capitalized at 5 per cent.....	\$165,932 00	
Per foot of dock, excess cost of timber crib dock....	71 77	

"The cost of renewals is based on the following: For the timber crib—Flooring will not last over five years; the pine superstructure ten years, which will require rehandling of that part of the stone surrounding the pine timbers at the time of renewal, in addition to the filling necessary by the gradual settlement of the stone in the crib. For the concrete dock—The fenders are assumed to last four years; mooring posts and anchorage renewal in twenty years; half of the concrete in thirty years, on account of wear and tear and possible alteration due to changes in the nature of the occupancy of adjacent land. In the experience of the south works of the Illinois company on a dock frontage of over 7,000 ft. the life of timber or pile and sheeting dockage is not over nine years at the most before reconstruction or very extensive repairs are needed. This extends over a period of twenty years.

"The difference in cost of the concrete style of dock as compared with the masonry dock rising from foundations below the river or slip bottom is very marked. A large increase in cost with the latter construction is caused by the necessity for extensive caisson work, requiring constant pumping, the maintenance of levels of adjoining property without injury during construction, and the added expense of carrying the masonry to the required depth. This in many cases will still call for a substructure of piles and grillage to avoid settlement and cracking of the dock under construction."

William E. Woodall & Co., Baltimore, Md., will shortly launch the three-masted schooner which they are building for stock. This vessel is 117 ft. long, 29 ft. beam and 8½ ft. depth of hold. The company will build a steamer for the Southern Railway Co. to take the place of the Memphis, burned. The new steamer will be 5 ft. longer than the Memphis.

NAVAL COALING STATIONS.

A dispatch from Washington to the Coal Trade Bulletin says that one of the striking developments in American sea power is the numerous coaling stations that have been established in all parts of the globe along the ocean highways where the United States must hereafter maintain communication. The character of the achievement may be readily appreciated when it is stated that four years ago the United States did not possess a pound of coal for its ships save amounts bought from day to day to fill the bunkers of ships in commission, while today the national vessels can supply themselves from governmental stores in thirty-one ports. Rear Admiral Bradford has been very energetic in establishing these stations and keeps posted in his office a bulletin showing the available coal supplies at all of them. The following data shows the capacity and the amount on hand at each station: Algiers, La., 15,000 tons; on hand, none; Annapolis, open storage, 2,861 tons; Boston, 15,000 tons, 3,770 tons; Dry Tortugas, 20,000 tons, under construction; Frenchman's Bay, 10,000 tons, nearly complete; Guam, construction not begun, awaiting harbor improvements; Honolulu, 20,000 tons, 12,560 tons; Key West, 22,000 tons, 6,845 tons; Manila, 25,000 tons under cover, indefinite amount in open; Mare Island, 7,500 tons, 729 tons; Narragansett Bay, 10,000 tons, under construction; New York, 10,000 tons, under construction; Newport training station, 600 tons, 315 tons; Newport torpedo station, 500 tons, 264 tons; New London, 10,000 tons, 477 tons; Norfolk, 2,000 tons, 1,500 tons; Portsmouth, N. H., 10,000 tons, 1,810 tons; Puget Sound, 8,000 tons, 2,031 tons; Pensacola, 10,000 tons, 2,631 tons; Philadelphia, 5,000 tons, 402 tons; Pago Pago, 5,000 tons, 1,236 tons; Port Royal, 800 tons, 940 tons; Pichilique, 5,000 tons, 4,559 tons; San Juan, 8,000 tons, 5,578 tons; San Diego, 10,000 tons, projected; Sitka, 2,500, 823 tons; Washington, D. C., 4,000 tons, 1,414 tons; Yokohama, 10,000 tons, 11,824 tons.

The bulletin, astonishing as is the information it presents, does not tell half the story. It simply shows that American war vessels are always now within ready steaming distance of supply bases; that the government is now possessed of a store of 115,513 tons of the best coal, most advantageously distributed in twenty-one distinct ports; that at seventeen of these fireproof sheds and wharves, equipped with the latest automatic conveying apparatus, have been completed, with 146,900 tons capacity; that at nine other places similar plants and facilities are projected, to be built from appropriations already made by congress; that at five other ports such stations with 49,000 tons capacity are under construction, and that provision is already being made for storing and quickly handling an aggregate of 305,900 tons. All this has been done in four years without any blare of trumpets.

Twenty-one of the stations are ports of the United States. Pago-Pago on the south, Sitka on the north, Manila on the extreme west, and Honolulu and Guam are, with Pichilique and Yokohama, leased in perpetuity from Mexico and Japan, the sentry posts of the Pacific. Tortugas and San Juan guard the entrances to the Caribbean, soon to be reinforced by St. Thomas in all likelihood, while filled coal barges, each of 1,500 tons capacity, already anchored at Havana, Cienfuegos, Guantanamo and Nipe, sufficiently indicate the stations Cuba will be asked to provide under her acceptance of the Platt amendment. Of pending diplomatic negotiations which will notably add to this list, especially those near the Atlantic and Pacific approaches to the Isthmian canal, no more can be said at this time than they are confidently expected to succeed in due season.

Beyond the remarkable coal bulletin above, the great collier fleet now owned by the navy is of almost equal importance with the shore bases, of which it is the indispensable adjunct. Within four years twenty of these capacious and powerful naval auxiliaries have been acquired, and fifteen of these are in commission constantly engaged in transporting fuel to the various stations and fleets. The names, tonnage and duties just now are as follows: Abarenda, 4,670, at Pago-Pago station, station ship; Celtic, 6,428, at Manila, discharging; Iris, 6,100, at Cavite, station ship; Saturn, 6,220, at Cavite, discharging; Nanshang, 4,827, at Cavite, island service; Justin, 3,300, at Guam, station ship; Pompey, 3,085, at Guam, discharging; Rainbow, 6,206, at Palermo, homeward bound; Ajax, 7,500, at Singapore, homeward bound; Caesar, 5,016, at Colombo, bound for Manila; Hannibal, 4,291, Cienfuegos, with North Atlantic fleet; Lebanon, 3,375, Cienfuegos, with North Atlantic fleet; Leonidas, 4,242, Norfolk, loading; Nero, 4,925, San Juan, station ship; Sterling, 5,663, Guantanamo, discharging; Arethusa, 6,200; Oolongapo, station ship.

All these except the station ships are actively engaged in carrying coal from Norfolk and other home ports to the established stations, and the others not named are either under repair or held in reserve until coal prices are more favorable than at present. Not least in importance among the reforms Admiral Bradford has accomplished with this collier fleet is that today every American warship, in whatever quarter of the globe she happens to be, is burning American coal, while four years ago, outside of home ports and in the West Indies, English coal alone was available for them.

The prestige which a concern attains in a special line of manufacture is often likely to seriously overshadow its development in other lines. An interesting example is that of the B. F. Sturtevant Co. of Boston, Mass. This company is undoubtedly known from one end of the country to the other as manufacturers of fan blowers. Sturtevant blowers are found everywhere. But alongside of the development of the blower by this company has been a similarly progressive development of the high-speed engine in a great variety of designs and sizes, ranging from 3 to 300 H.P. Designed originally for direct attachment to fans, the use of these engines, because of their special qualifications, has broadened into a larger field, particularly the direct-connected driving of Sturtevant generators. This has brought the annual output up to fully 1,000 engines per year and given the Sturtevant engine a name and position which is only overshadowed by that of the Sturtevant blower.

It is now definitely announced that Secretary of the Navy Long will resign from the president's cabinet in the spring. Indeed Mr. Long personally would have preferred to resign some time ago but the unfortunate Sampson-Schley controversy prevented him from doing so. The president has now indorsed Mr. Long's views upon this subject and effectually settled the controversy, and consequently Mr. Long feels at liberty to resign.

OFFICERS OF LAKE VESSELS FOR 1902.

BROWN, W. W., 1105-1109 Williamson Bldg., Cleveland.

Str. L. C. Smith	Capt. E. T. Rattray....	Engr. Duncan Fraser.
" Wm. Nottingham ..	" C. D. Woodward....	" Jno. Davidson.
" H. S. Wilkinson....	" Wm. Smith	" Geo. Averill.
" W. W. Brown.....	" H. F. Loftus....	" Arch. Henderson.
" A. G. Brower.....	" Frank Boyer	" Robt. Leitch.
" Wm. H. Gratwick....	" Sidney LeBeau....	" A. Barker.
" Geo. Presley	" R. Z. Utley.....	" J. W. Brown.
Schr. N. Reddington ..	"	"

SMITH, FRANK W., Foot of Mineral St., Milwaukee.

Str. Pueblo	Capt. Duncan Stalker....	Engr. W. J. Reardon.
" Topeka	" David Wilson	" H. C. McLean.
" Denver	" E. A. McGregor....	" Jno. Smith.
" Omaha	" D. W. Carr.....	"
" J. W. Wescott	" H. Wanvig	" C. Olson.
" Mary H. Boyce....	" J. D. Wanvig.....	" H. Stokke.

MINNEAPOLIS, ST. PAUL & BUFFALO STEAMSHIP CO.,**J. C. Maelay, Gen. Mgr., Buffalo, N. Y.**

Str. St. Paul	Capt. Peter Thompson....	Engr. Henry Stone.
" Minneapolis	" Geo. W. Moore....	" D. J. McMillan.
" Huron	" W. Moore	" C. C. Folkerts.
" Wm. Castle Rhodes.	" P. Dowdell	" Guy Hemenger.

REND & CO., W. P., 115 Dearborn St., Chicago.

Str. G. G. Hadley.....	Capt. M. Fitzgerald ...	Engr.
" Panther	" J. H. Madden....	"
Schr. Massasoit	" D. Buchanan.	"

MARINE TRANSIT CO., John Drawe, Mgr., Marine City, Mich.

Str. Toltec	Capt. Henry Shackett ..	Engr. A. Horten.
Schr. Zapotec	" Peter Thomson.	"

SHACKETT, J. M., Mgr., Marine City, Mich.

Str. Faustin.....	Capt. J. M. Shackett....	Engr. Saml. Radcliffe.
Schr. Amaretta Mosher..	" Jos. Shackett.	"

LOUD, H. N., Oscoda, Mich.

Str. Jno. B. Ketchum 2d	Capt. M. Christy	Engr. Geo. Bowen.
" Seattle	" C. E. Barnes.....	" Thos. Braund.

MCGRAW TRANS. CO., Bay City, Mich.

Str. City of Paris.....	Capt. E. D. Ballentine....	Engr. W. C. McDougall.
" City of Venice.....	" Philip Broderick....	" J. A. McDougall.

KOCH, C. McG., Sandusky, O.

Str. Annie Laura	Capt. D. O. Lockhart....	Engr. J. Shampaign.
Schr. Dashing Wave....	" J. A. Lockhart.	"

PIERCE, Wm. E., West Bay City, Mich.

Str. Benton	Capt. Wm. E. Pierce....	Engr. Aaron Hagadon.
Schr. J. C. Filmore....	" Frank Ortlein.	"

KIRKER, FRED, Managing Owner, Bay City, Mich.

Schr. Wm. Brake	Capt. Fred Kirker.	"
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CALUMET TRANSIT CO., F. W. Smith, Managing Owner, Milwaukee.

Str. E. M. Peck	Capt. A. C. Callam....	Engr. Wm. Noble.
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LOUTIT, W. H., Grand Haven, Mich.

Str. Pentland	Capt. T. McCambridge....	Engr. C. Ball.
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MEHL, EDWARD, Erie, Pa.

Str. Uganda	Capt. W. W. Wilkins....	Engr. W. Millington.
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TAYLOR, M. H., Erie, Pa.

Str. Niagara	Capt. M. A. Budd	Engr. A. Turner.
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MANITOU STEAMSHIP CO., N. F. Leopold, Prest., Chicago.

Str. Manitou	Capt. Allan McIntyre....	Engr. Roy L. Peck.
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RICE, W. E., Harbor Beach, Mich.

Str. Rhoda Stewart	Capt. Wm. J. Cowles....	Engr. G. McClelland.
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FAIRGRIEVE & CO., J. B., Hamilton, Ont.

Str. Arabian	Capt. Oliver Patenaude.	Engr. J. H. Brown.
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CARLETON, EUGENE M., Cleveland.

Str. H. D. Coffinberry..	Capt. Wm. Furgeson ..	Engr.
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WANWIG, A. C., 79 Evergreen Ave., Chicago.

Str. J. D. Marshall.....	Capt. A. C. Wanwig ...	Engr. Christ Dahl.
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MR. SCHWAB RE-ELECTED PRESIDENT.

Percival Roberts, Jr., who was the president of the American Bridge Co. when it was taken over by the United States Steel Corporation, resigned as a member of the executive committee at the regular monthly meeting of the directors in New York this week. The cause of his resignation is said to be that he and President Schwab could not get along together. All the directors, when approached for an explanation, preferred to say nothing. It has been generally known, however, for several months that Mr. Roberts was dissatisfied. At the meeting Mr. Schwab was re-elected president and all the other officers were continued in their respective positions. The corporation will on April 1 have been in existence a year, and it is estimated that its net earnings for that period will reach \$111,000,000. If the market conditions remain unchanged the earnings for the second year will be even greater.

The Cunard liner Etruria broke her propeller shaft in mid-ocean this week and had to be towed to the Azores by the Leyland liner Cliff. The Etruria is a single-screw vessel, but probably the fastest of that type in the world. She has repeatedly beaten some of the crack twin-screw liners and has a record from Queenstown to Sandy Hook light-ship of 5 days, 20 hours and 55 minutes. All the other Cunarders, with the exception of the Umbria, are twin-screw vessels. Indeed, it is such accidents as these that prove the wisdom of the twin-screw. The Etruria was built in 1884.

AROUND THE GREAT LAKES.

It is understood that the city authorities at Port Stanley, Lake Erie, have offered the Bertram Engine Works Co. a free site if it will locate a ship building plant at that port.

Messrs. Bartlett & Tinker have been appointed agents of the Union Transit Co. at Cleveland, vice A. E. Thompson, resigned. Their offices and docks are at 57 River street.

With the sale of the steamer John Oades to the C. Reiss Coal Co., A. A. & B. W. Parker of Detroit have disposed of all interests in freight carriers. They are still interested in the excursion steamers of the St. Clair and Detroit rivers.

P. M. Church of Sault Ste. Marie, Mich., has again been awarded the contract for care of buoys on the Sault river. A contract has also been awarded by the government to Eliphalet A. Gustin of West Bay City, Mich., \$223, for keeping buoys on Saginaw river.

During the coming season the steamer Bielman, sold recently by the Stewart Transportation Co. to Port Huron parties, will tow the schooner Mary E. McLachlan. Capt. J. W. Montgomery will command the Bielman, and Capt. Maitland will sail the McLachlan.

The United States survey office is issuing almost every week new colored charts of the lakes. Among the latest is Manitou passage, Lake Michigan; also a revision of the chart of Lake St. Clair and chart No. 2 of the St. Mary's river. These charts are all kept in stock by the Marine Review.

A dispatch from Duluth says that the outlook at the head of the lakes for lumber business during 1902 was never better. Manufacturers are confident that they will get good prices, and are not over anxious to sell at the present time. Buyers from the east have been plenty in Duluth since the first of the year. Sales for the past week have amounted to 30,000,000 ft.

H. B. & G. B. Burger have transferred their ship yard and dry dock property at Manitowoc to the Ship Owners' Dry Dock Co. of Chicago. With land donated by the Wisconsin Central and Chicago & Northwestern railway companies there will be in all fifteen acres available for enlargement of the Manitowoc works. It is said that the Ship Owners' company proposes to build a dry dock suited to the largest vessels of the lakes, and to undertake the construction of steel vessels on a large scale.

The right of cities and towns to construct waterworks cribs in navigable waters and their liability in case vessels run into cribs will be the basis shortly of an important decision by Judge Kohlsaat in the United States district court at Chicago. The decision will come in the Conestoga case, where the Anchor line is endeavoring to collect some \$70,000 from the city of Chicago on account of a collision three years ago by the Conestoga with the waterworks crib off Chicago avenue. The case has been sharply contested throughout.

It is reported in Detroit that Mr. Frank E. Kirby has been at work for some time devising a model for a life boat which will be absolutely unsinkable, self-righting, light in construction and buoyant. The first boat will be turned out by the Michigan Steel Boat & Power Co. within a few days and a thorough test will be given it. The new boat will be used, it is said, on the steamers Eastern States and Western States of the new Detroit & Buffalo line. Each steamer will be equipped with ten boats, eight of them 24 ft. long, 7 ft. wide and 3 ft. deep, and two will be 20 ft. long, 6½ ft. wide and 2½ ft. deep. The larger boats will have a capacity of thirty persons and the smaller twenty persons. One striking feature of the new boats will be that the stem, keel and stern, with the hooks upon which the boats will hang from the davits of the steamer, will be one piece of steel, giving stability and strength and make them stiff. The galvanized steel plates of which the new life boats will be constructed will run diagonally from the gunwales to the keel, to which they will be fastened by means of a flange. The water-tight compartments, one at the bow and another at the stern, will give buoyancy to the boats, and it is claimed by the inventor that, even should the boats fill with water they would still keep thirty persons afloat. The boats will be self-righting but not self-bailing. The first of the new life boats will be ready for a test in about a week.

BELLEISLE BATTERED AGAIN.

The Belleisle hulk, which has been specially fitted up for experiments, was fired into off Bembridge, Isle of Wight, last week to test the resistance of armor. The gunboats Pincher, mounting a 9.2-in. gun, and the Comet, armed with a 6-in. gun, did the firing. A 20-ft. section of the Belleisle on each bow had been fitted with a type of plate manufactured by Messrs. Cammell & Co. of Sheffield, the principal feature of the plate being that it was only partially Krupped, in order to ascertain the elasticity and resistance of a plate made under these conditions. In thickness the 6-in. plate on the starboard side of the Belleisle represented the armor of the Drake class of cruiser, and the 4-in. plate on the port side the armor of the "County" class. Internally the ship in the armored section was fitted with bunkers, transverse bulkheads and other supports such as would be found in the armored area of seagoing ships. The new form of lyddite, as well as armor-piercing projectile, and common shell, were used, and the utmost precautions were taken to police the vicinity, both ashore and afloat, in order to prevent unauthorized persons from coming within a clear view of the operations. In all ten rounds were fired, the 6-in. plate being first attacked. Two rounds were fired from the 6-in. gun, followed by two rounds from the more powerful weapon, and after each pair of rounds the ship was visited by the lords of the admiralty, and photographs were taken. The Belleisle was moored broadside on to the shore, and after the thicker plate had been tried the ship was turned round and the port side was fired into, when again both guns were used. As far as could be seen from the shore, the concussion at each round was so great as to cause considerable debris, and ultimately it looked as though the 9.2-in. gun had penetrated the 4-in. plate, as the vessel appeared to be sinking. She was drawing 15 ft., and had only 16 ft. of water under her; so that when a party of bluejackets had gone on board and patched up the leaks, it was found possible, with the extra provision of collision mats, to tow her back to Portsmouth.

SHIPPING BILL IN THE SENATE.

Senator Frye's shipping bill was called up in the senate on Tuesday of this week under much more favorable auspices than attended its appearance in the last congress. Mr. Frye explained the bill in his usual clear and lucid manner, dwelling with emphasis on the important point that should any two of the great European maritime powers go to war the farmers and manufacturers of the United States would soon find themselves shut out from the markets of the world, whereas if the merchant marine of this country is rehabilitated as provided for in the Frye bill the productive energies of the United States would not be thus paralyzed during the progress of a foreign war. Mr. Frye was heard with marked attention by a full chamber and was frequently interrupted with questions from the democratic side. It is expected that Senator Clay of Georgia will again lead the opposition to the bill, but it is not thought that he can make much headway against the virtually solid republican support now assured for it. In the last congress the bill was defeated through republican indifference, due to the fact that some of its features did not meet the approval of an influential group of western republican senators. Mr. Frye eliminated all these objections and there is excellent reason to believe that the bill will pass the senate by a good majority without material amendment.

Mr. Frye said it seemed to him that the policy of protection had been vastly beneficial to the American people. Only one industry had been without protection for fifty years, and with the logical result. The shipping interests of the country had been neglected in the giving of protection. With a sea coast boundless, with enormous deposits of iron and coal, with the most sagacious business men in the world, with the advantage of every natural resource on the side of the United States, this country had permitted its inferiors to seize the pathways of ocean commerce almost without a struggle.

"It seems to me," said Mr. Frye, "that that picture ought to humiliate and mortify beyond expression any patriotic citizen of the United States who glories in the power and prosperity of his country. It is not alone humiliating—it is absolutely dangerous."

Mr. Frye asked who was going to carry the \$487,000,000 of exports in the event of a war between two European nations. "Why," said he, "the farmers and the manufacturers and the wage earners of the United States would pay a penalty equal to that paid by either of the contending parties." Mr. Frye then sought to show that this condition of things was caused by American wages, which increased the cost of ships for the foreign trade at least 25 per cent. He declared that of all steamships in the world of 14 knots and upward 80 per cent are subsidized by the countries whose flags they carry. Of 16 knots and upward, he said, all but six in the world are heavily subsidized by the countries whose flags they float. The nations paying those subsidies, he declared, did so for the purpose of extending their trade, and for nothing else. "Trade cannot precede the mail," said he, "the mail must precede the trade."

Mr. Frye contended that there is not a nation on this earth that needs markets for its surplus products more than the United States. An American ship, handled by intelligent, active, earnest and interested American officers, he said, is a better instrument for the distribution of our products abroad than a German ship, officered with Germans, Germany being a strong commercial rival of the United States. Mr. Frye declared that free ships, for which some senators were contending, would mean an increase in cost of ships of 25 per cent, and would close every ship yard in the United States against building any vessel for foreign trade. He said that bounties had been suggested, but these were repugnant to the constitution and a violation of thirty-four commercial treaties with different nations of the world. "Now, these nations are today looking jealously at us," said Mr. Frye, "and it is said that they are studying the problem as to how they can stop us from getting into these foreign markets." To abrogate these treaties would only serve as an excuse for retaliation. The only way to accomplish anything in the direction indicated by him would be to pay from the treasury of the United States annually a sum of money, which shall be equal to the difference between the operating and carrying on of the trade in foreign ships and that carried in American vessels. The republican party had stood by that idea of protection and encouragement ever since it had been in power, and the party, he insisted, could not excuse itself for leaving an industry as important as this entirely unprotected. The word "subsidy," he said, should not terrify any one, because it was only another name of protection.

Mr. Frye said that the enactment of the pending bill would increase in two years the expenditures in American ship yards by \$40,000,000. Mail subsidies amounted to nearly \$3,000,000 a year, and would act as an offset to the \$6,000,000 that would be paid in subsidies to American shipping. The bill, he thought, did not present a very serious proposition to the senate, which would authorize in five minutes the construction of a battleship costing \$5,000,000 and pass a river and harbor bill carrying \$60,000,000 in a few hours or days. If in any respect the bill worked badly it could be amended or repealed outright.

At the close of Mr. Frye's statement Mr. Bacon of Georgia inquired as to the condition of business in American ship yards. Was it true that they were full of orders?

"It is not true," replied Mr. Frye.

Mr. Bacon asked if Mr. Frye had not noted in the newspapers the glowing accounts of the work being done in American ship yards.

Mr. Frye replied that he had seen a paragraph to the effect that Mr. Furness of Great Britain had made a contract recently for the construction of eight steamships in American yards. The fact was that the contract had been made for the construction of the eight steamships in Great Britain.

In response to an inquiry from Mr. Clay of Georgia Mr. Frye said



AN ICE SCENE—MIDWINTER NAVIGATION ON DETROIT RIVER.

Detroit, Belle Isle & Windsor Ferry Co.'s ice crusher Promise towing hull of new side-wheel steamer Greyhound (275 ft. long by 25 ft. beam) from ship yard at Wyandotte to Detroit. Solid cake ice from 15 to 21 in. thick; reefed ice from 3 to 10 ft. deep. Distance from Detroit to Wyandotte and return, 20 miles; time, 4½ hours.

there was no law now which required that Americans should be employed on American ships. The pending bill, he said, provided that in the first year one-fourth of the crews of American vessels should be citizens of the United States, the second year one-third, and the third year one-half.

Mr. Clay and Mr. Bacon both insisted that the crews of the Pacific Mail Steamship Co. were largely Chinese, and the former read the testimony of the captain of the China of that line, showing that about one-third of the crew were Chinese.

RIVER AND HARBOR BILL.

The river and harbor bill has been presented to the house of representatives and carries an aggregate appropriation of \$60,000,000. The total is about \$2,000,000 more than that carried in the bill which Senator Carter talked to death last year. Briefly, its provisions for the great lakes are: Cleveland gets \$500,000 cash appropriation and a total expenditure of \$2,300,000 is authorized. The bill contains a provision for the extension of the breakwater as far as Gordon park. It will be recalled that upon this point Senator Hanna and Mr. Burton disagree. Mr. Hanna thinks that the breakwater should not be extended further east than Case avenue. Buffalo fares very well in the bill. The proposed channel to the Erie basin and Blackwell channel receives \$814,643, an amount sufficient to complete the proposed project. Niagara river gets \$257,700, which is three times as much as it received in 1899 and five times as much as it got in 1894. The Buffalo items include a survey for Black Rock harbor with a view to obtaining a suitable channel for deep-draught vessels around the rapids and shoals at the head of Niagara river.

Cash appropriations for the principal Lake Erie ports are as follows: Toledo, \$15,000; Port Clinton, \$5,000; Sandusky, \$125,000; Huron, \$25,000; Lorain, \$6,000; Fairport, \$200,000; Ashtabula, \$125,000; Conneaut, \$200,000. Other provisions of the bill are: Michigan—Marquette, \$25,000 and continuing contract, \$80,000; Grand Marais harbor of refuge, \$70,000; Holland, \$73,000; Muskegon, \$75,000; Pentwater and White Lake harbor, \$35,000; Ludington, \$75,000; Manistee, \$42,000; Portage lake harbor of refuge, \$59,000; Frankfort, \$54,000. Wisconsin—Ashland, \$40,000; Green Bay, \$105,000; Sturgeon bay and Lake Michigan ship canal and Sturgeon bay harbor of refuge \$44,000, and continuing contract \$178,000; Sheboygan, \$90,000; Milwaukee harbor and harbor of refuge, \$232,500; Port Wing, \$25,000. Minnesota—Duluth and Superior harbor, \$275,000. Most important among lake items in the measure are an appropriation of \$320,000 for the St. Clair flats canal, an additional canal being necessary for the accommodation of the commerce of the great lakes; \$500,000 for the improvement of Hay Lake channel and a continuing contract appropriation of \$4,000,000. For the improvement of Detroit river from Detroit to Lake Erie \$500,000 is allowed in cash and \$1,250,000 for continuing contracts.

The Chesapeake & Ohio Railway Co.'s steamer Virginia, building by the Wm. R. Trigg Co., Richmond, Va., is rapidly nearing completion. The Virginia is a twin-screw steel steamer, 200 ft. long, 32 ft. beam and 12 ft. 8 in. deep.

EXPORT FIGURES FOR JANUARY.

The export figures for the month of January and the seven months ending with January, 1902, just completed by the treasury bureau of statistics, show an improvement in the outward movement of manufactures. In the month of January, 1902, the exports of manufactures amounted to \$34,412,992, against \$32,654,035 in January, 1901, and are the largest shown in any January except 1900, when the total was \$35,586,940. Compared with January, 1901, it will be seen that the figures show a gain of nearly \$2,000,000 in the exports of manufactures. For the seven months ending with January the exports of manufactures are about \$13,000,000 less than those for the corresponding period of the fiscal year 1901. Indeed manufactures for the month of January show greater evidence of activity in the export trade than any other class of our exports; being the only great class of exports which shows an increase in January, 1902, over January, 1901. Agricultural exports in January, 1902, fall \$8,000,000 below those of January last year, while products of the mines, forests, and fisheries are in January, 1902, slightly below those of January, 1901; while manufactures, as above indicated, are nearly \$2,000,000 greater than those of January, 1901. In the three great articles in which manufactures had shown a decline during the past year—illuminating oil, copper manufactures, and manufactures of iron and steel—there is a decided improvement, especially in illuminating oil and copper. The January exports of illuminating oil are \$4,579,970, against \$3,986,019 in January, 1901; and for the seven months ending with January are \$33,774,156, against \$31,166,759 in the seven months ending with January, 1901, and \$33,239,556 in the corresponding months ending with January, 1900, thus exceeding the highest preceding record in the value of exports of mineral oil during the period under consideration. In copper manufactures the exports of January are valued at \$3,965,622, against \$3,790,364 in January of last year. The quantity exported has very largely increased, the total number of pounds of copper ingots alone (which form the bulk of copper manufactures) being in January, 1902, 32,085,041 lbs., against 22,270,030 lbs. in January, 1901, and 28,389,422 lbs. in January, 1900. For the seven months, however, the exports of copper manufactures are still about \$9,000,000 below those of the corresponding seven months of the preceding fiscal year. It will be observed that the quantity of copper exported has greatly increased, though the value shows but a comparatively slight increase. The only item of importance in the list of manufactures exported which still shows a reduction is that of iron and steel, which falls in January about \$1,500,000 below the figures of January, 1901, being in January, 1902, \$8,088,958, against \$9,610,552 in January, 1901, and \$10,218,628 in January, 1900. For the seven months the total exports of iron and steel manufactures were valued at \$57,290,128, against \$73,616,467 for the seven months ending with January, 1901, and \$66,504,611 for the corresponding seven months of the fiscal year 1900.

The continued activity of the American manufacturer, which is shown in the steady outward movement of all manufactures except in the one class above noted, is further illustrated by a remarkable increase in the importations of manufacturers' materials. The bureau of statistics classifies the importations into five great groups—foodstuffs, raw materials for use in manufacturing, material partially or wholly manufactured for use in manufacturing, finished manufactures, and luxuries. In these five great divisions the chief increase is in manufacturers' materials. They show in the single month of January an increase of \$7,500,000 and in the seven months ending with January an increase of \$50,000,000, compared with the corresponding periods of the preceding fiscal year. The total increase in importations during the seven months ending with January is \$67,000,000, of which \$50,000,000 is in manufacturers' materials.

The following table shows the imports and exports by great classes in the month of January, 1902, compared with January, 1901:

	Jan. 1901.	Jan. 1902.
IMPORTS.		
Food and live animals	\$ 16,718,448	\$ 16,273,453
Crude manufacturers' material	23,166,281	30,445,623
Partially manufactured or wholly manufactured materials for manufacturers' use.	6,411,688	6,886,890
Finished manufactures	11,709,259	12,910,991
Luxuries, etc.	11,301,404	12,621,235
Total imports	\$ 69,307,080	\$ 79,138,192
EXPORTS.		
Agricultural products	\$ 92,565,242	\$ 84,477,950
Manufactures	32,654,035	34,412,992
Products of mines	3,011,212	2,912,011
Products of forests	3,983,475	3,328,987
Products of fisheries	656,301	477,719
Miscellaneous	505,310	756,651
Total domestic exports	\$133,375,575	\$126,366,310
Foreign exports	2,950,026	2,770,134
Total exports	\$136,325,601	\$129,136,444

At Wood's yard, City Island, New York, five small boats are being built from designs made by Messrs. Tams, Lemoine & Crane. One is a raceabout for Mr. H. M. Crane, which will be quite similar to the raceabout Merrywing that Mr. Crane owned last season. Another boat is for Mr. John R. Suydam, who will race her in the 30-ft. class on Great South bay. She is 44 ft. 9 in. over all, 25 ft. water line, 13 ft. breadth, and 3 ft. draught. The other three boats will be raced in the 30-ft. class at Bar Harbor, and will be owned by Messrs. Everett Macy, Walter G. Ladd and W. B. Taylor. The Bar Harbor Yacht Racing Association will race under the new rule adopted by the Yacht Racing Association of Long Island Sound, and the three latter boats are designed under the new rule.

The Thomas Furnace Co., who purchased the Minerva blast furnace at Milwaukee have repaired the dock at their plant and have equipped same with three Brown hoists, so that they will be able to take in their ore by vessel this season. The dock is located on the Kinnickinnic river near the Pere Marquette railroad dock.

SKILL IN BUILDING TORPEDO BOATS.

The following facts are of interest as showing with what certainty anticipated results are now secured when the necessary experience has been acquired. Time was when many runs had to be made and costly experiments undertaken with propellers, and alterations in the trim of a boat, in grates, in fans and in methods of firing before the promised speeds were reached. Here we see that in the present day the torpedo destroyer can be turned out with as much certainty as a tramp steamer. The list refers to torpedo boat destroyers built for the Japanese navy by Yarrow & Co., Ltd., Poplar, England. It is taken from the Engineer, London:

Name.	Date of launch.	Date of official trial.	Speed in knots.
Ikadsuchi.....	Nov. 15, 1898.....	Dec. 23, 1898.....	31.32
Inadsuma.....	Jan. 28, 1899.....	March 8, 1899.....	31.037
Akebono.....	April 25, 1899.....	May 4, 1899.....	31.08
Sazanami.....	July 8, 1899.....	July 20, 1899.....	31.382
Oboro.....	Oct. 5, 1899.....	Oct. 14, 1899.....	31.262
Niji.....	Dec. 16, 1899.....	Dec. 21, 1899.....	31.156
Akatsuki.....	Nov. 13, 1901.....	Nov. 21, 1901.....	31.121
Kasumi.....	Jan. 23, 1902.....	Jan. 29, 1902.....	31.245

The trial in each case consisted of a continuous run of three hours' duration, carrying a load of 35 tons in the case of the first six and 40 tons in the case of the last two destroyers. As an example of promptitude with which experienced firms can carry out special work, we call attention to the fact that on Thursday, Jan. 23, Yarrow & Co., of Poplar, launched a Japanese torpedo boat destroyer. She had her preliminary trial on Friday, Jan. 24, and the official trial took place on Wednesday, Jan. 29. The official trial consisted of a three hours' continuous run with a load of 40 tons on board, the speed being ascertained by six runs at the Maplin measured mile. The following is a record of the six measured-mile runs:

Run.	Hour.	Air pressure in strokehold.	Revolutions per minute.	Time.	Speed.	First mean.	Second mean.	Admiralty mean.
1	a. m. 11.13	Inch. .6	395.8	m. s. 2 4	29.032	30.969		
2	11.24	.93	392.1	1 49.4	32.906	30.795	30.882	
3	11.33	.9	390.3	2 5.5	28.685	31.087	30.941	31.075 knots on measured mile.
4	11.43	1.1	396.8	1 47.5	33.488	31.236	31.161	
5	11.54	1.1	398.1	2 4.2	28.985	31.394	31.315	
6	12.3	1.2	401.7	1 46.5	33.802			

After the six runs were made, to ascertain the advance per revolution of the screw, a three hours' trial was proceeded with, with the result that a mean speed, during the three hours, of 31.245 knots was obtained.

LAUNCH OF THE COLUMBIA.

By far the largest and finest vessel ever built for the New York and Glasgow trade has been launched on the Clyde for the Anchor line. It is named the Columbia and is 500 ft. over all, 56 ft. molded breadth and 36 ft. deep. The Columbia was christened by Lady Balfour of Burleigh, wife of Lord Balfour, secretary of state of Scotland, and is a strikingly handsome and imposing looking vessel, with a straight stem and elliptical stern, having two steel pole masts for fore-and-aft schooner rig and three funnels. The vessel is divided up, so as to insure safety, into nine watertight compartments, and has six decks.

The first saloon is amidships, with accommodation for 216 passengers on the bridge and main deck. State rooms on the bridge deck are luxuriously fitted with couches, folding washstands, wardrobes and electric lights, and have large square windows fitted with ornamental shutters that can be adjusted at will. The main saloon is on the upper deck, a very handsome apartment. The decorations are bright and artistic, furniture and general appointments being very handsome. There will be a number of small tables in the main saloon for the accommodation of family parties. Above the main saloon on the bridge deck is the library, a spacious, well appointed room, 36 ft. by 36 ft. On the promenade deck there is a luxuriously fitted smoking room with dome skylight and large windows, making it a bright and most cheerful place. The promenade deck on the Columbia is a special feature. Saloon passengers will have a long bridge deck and a promenade deck below of 230 ft. in length, with water-proof shelters and wind screen. These decks will be lighted with electricity, which will make them as light by night as by day.

The second saloon is situated on the main deck, with accommodation for 280 passengers, who will find that their comfort and convenience in every respect have been excellently catered to. The dining saloon for this class is on the upper deck, the furniture is all oak and much superior in design and finish to what one usually sees in second saloon accommodation. In this class there is a ladies' room and library directly above the saloon, and on the promenade deck there is a spacious, well appointed smoking room. In fact, no pains or expense has been spared to make the second cabin accommodation on the Columbia equal to that of any other steamer on the Atlantic.

The third class accommodation is on the main and 'tween decks. Married couples, families, single women and men are berthed in separate apartments. Dining accommodation for this class is provided with tables and seats, permanently fixed. Nothing has been left undone to make this accommodation modern and up to date in every respect. On the upper deck a comfortable sitting room for women and smoking room for men have been provided.

The Columbia is propelled by two sets of powerful triple-expansion engines of the latest type. A very thorough and complete system of natural and mechanical ventilation has been fitted throughout the entire vessel, and electric fans have been placed wherever required.

AMERICAN INVASION OF CANADA.

Latterly the newspapers have been full of the threatened invasion of Canada by American capital and a number of Canadians have expressed apprehension at this tendency. Indeed some of them have, in our judgment, talked wildly upon the subject. The Toronto Star contains the most sensible editorial upon the so-called invasion that it has been our good fortune to see. The Star says:

"The invasion referred to is not warlike, but peaceful—an invasion of capitalists with their money and men with their wives and families. The buying of the Canadian Atlantic railway by New York capitalists has started the question, accompanied as this transaction is by rumors of other large purchases of railway and steamship lines. The coal fields of Cape Breton are largely owned by an American company, the big iron works at Sidney, the Clergue enterprises at the Sault, with arms reaching all over New Ontario, the Cramps of Collingwood, and many other important enterprises are operated by American capitalists. The Yukon territory is full of Americans, and they are very numerous in British Columbia. Of the 9,108 homestead entries taken out in the northwest territories last year 3,258 were taken out by people from the United States, 205 by Canadians returned from that country, 3,521 by citizens of our own country. Of the newcomers who entered the west and made homestead entries 3,258 were Americans and only 2,124 came from all the rest of the world, including Great Britain, which sent only 945 of these. Many of our own people have moved from one part of the country to another, but of the new population that came in last year to the territories the Americans were more than three times as numerous as the Britishers, and one-third larger than those of all other nationalities combined. The inrush of capital seeking investment in manufactures and in developing the country's resources, and the inrush of people as evidenced by the above figures, is causing some people to feel anxious about the result to our political institutions.

"The discussion suggests the question whether we want to encourage money and people from the United States to come in here. For several years we have been admiring the Clergue industries, which have expended \$10,000,000 or \$12,000,000 at the Sault; Collingwood gave a bonus to the Cramps; we have boasted that Cape Breton is a place risen from the dead at the touch of the capitalistic hand; we have had government agents in the United States inducing farmers to move across to our western prairies. The people are beginning to come in large numbers; capital having made some success, grows interested in our resources. Do we want the people? Do we want this outside capital? If we do not want them it will be a singular and difficult task to turn them back, now that the homeseekers have turned our way and the capital of the United States exceeds its own requirements.

"It was said of the Boer republics that they were fated to fall because they stood stubbornly and unwisely in the way of world's progress. They had a population about the same as that of the city of Toronto, and they sought to monopolize nearly one-half of one of the five great divisions of the earth, withholding it from the urgent and imperative uses of mankind. They neither developed their country nor allowed of its development, and the on-moving world had to carry them away. It was charged against them that, unlike other countries, they did not invite settlement, did not welcome those who came nor allow them citizenship on equal terms with themselves, as was the rule under modern civilization. What could we do in Canada, if American capital and American settlers came in here with a force and numbers always increasing? Can we resort to the Boer method of denying citizenship to those who are willing to be good citizens? We suppose nobody will suggest it. But we can stand by our institutions and see that they are not overborne in the rush. No matter how strong the inrush may be—and its dimensions and dangers are often exaggerated—our great security lies in the fact that our institutions are in themselves admirable, and do not require to be overturned in order to give free scope to any legitimate purposes that may actuate newcomers. Our institutions, being elastic, will adapt themselves to changing conditions, and the man from the United States will find nothing here essentially different from what he has been accustomed to at home. He should, therefore, readily become a good citizen. Capital is non-patriotic. It speaks all languages equally well and is indifferent to flags, so long as it does not find that a particular flag prevents it from thriving. If there is to be an invasion of American men and money, we cannot close the gates nor do we wish to. All that is left then, is to inspire with our own Canadian spirit those who come among us, and win them to the best service of the country. Meanwhile we do not cut a good figure if we stand trembling before the immigration and investments which we have invited, and which we do not wish to exclude."

FOREIGN SUBSIDY QUESTION.

Mr. J. Thomann of the Hamburg-American line has written a letter to Fairplay, London, protesting against certain statements in a recent article in which it said that German ship owners received assistance from the government. Mr. Thomann says that Germany does not subsidize her steamship lines, either directly or indirectly, and so far as his letter goes it is correct. He should, however, in the interest of fairness, have stated that the German government allows a railway differential on all goods intended for export, which is certainly an advantage to the steamship lines, since it tends to increase their trade. He also thinks that in several instances American owners are benefited by a subsidy, but we know of no subsidy which an American vessel is receiving except the postal subsidy, and there aren't enough of them to earn the whole of that. His letter reads as follows:

"In your last week's issue you refer on page 201 to the unfair manner in which British ship owners are handicapped by the huge subsidies, direct and indirect, that are being granted to their foreign competitors. Referring to Germany you say: 'Germany pays no general direct subsidies, but allows large amounts to some particular lines; to its principal line it grants £280,000 per annum, representing 7 per cent. on the total capital of that company.' From this it would appear that Germany is paying on an 'indirect' subsidy to some particular lines, and in this connection permit me to say that the writer of the article in question is laboring under an absolutely erroneous impression in making this statement. Germany pays absolutely no subsidies, neither direct nor indirect, and the German ship builders and ship owners are placed on exactly the same terms as their British col-

leagues. Like every other country, England included, Germany pays the carriers of its mails on the basis of the postal union tariff. According to a statement which appeared in Fairplay about a year ago, the annual amounts thus paid were £764,117 in the case of England and £389,839 in the case of Germany. Of these amounts £113,640 went to the White Star line and the Cunard line, and £72,016 to the Hamburg-American line and the North German Lloyd for carrying the transatlantic mails. Besides these amounts Great Britain as well as Germany pays certain amounts to some particular lines under special contracts for services rendered by carrying the mails to and from distant countries by special fast boats. I ignore the total amount paid by the British government for such purposes, but considering that the Peninsular & Oriental Steam Navigation Co. alone receive something like £330,000 annually, which amount, by the way, was recently termed by the administrators of that company an insufficient remuneration for carrying the mails, it probably exceeds very considerably the £350,000 which is the annual total Germany pays to its steamship companies under similar contracts; the recipient of this amount being the North German Lloyd, which maintains a service of mail steamers to Australia, and which company, jointly with the Hamburg-American line, also maintains a service of mail steamers to East Asia, and the German East Africa line which run their mail boats to the east coast of Africa. The services which have to be rendered by these companies under these contracts are of such a complicated and expensive nature that what the Peninsular & Oriental said with reference to the insufficiency of the amount they receive applies fully as well to the remuneration paid these German lines. Excepting the mail boats running under these two contracts the very extensive steamship service from Germany to all parts of the globe is carried on without any help, either direct or indirect, from the government. The German steamship owners, just like their British colleagues, have to paddle their own canoes, and have to rely exclusively on what earnings they can secure in the open freight market.

"From the above it is evident that however rightly the British ship owner may complain of the disadvantage at which he is placed through the subsidies granted his foreign rivals, he has no reason to envy his German confrère, who—like himself—receives no subsidy whatever, and who—like himself—is left to fight, single-handed, against the huge subsidies that are being granted to his foreign competitors, for instance to French, Italian, and, I think, in several instances to American owners in the form of very considerable mileages, and to Russian owners by the refund of the Suez canal dues, etc. If you would kindly publish the above information in your much-valued columns I think it would help to remove a wrong idea that appears to be widely spread in the United Kingdom and its colonies, as well as in the United States of America."

EXPERIMENTAL STATION AT ANNAPOLIS.

A plan has been proposed to congress, with the approval of Secretary Long, by Rear Admiral George Wallace Melville, which is designed to make the United States naval academy one of the greatest scientific institutions and engineering schools of its kind in the world. Prince Henry in an address at Annapolis last week spoke of the importance of the academy to the government and the high stand it held among the institutions of the world. But, according to Admiral Melville, it is behind many of those at home in its engineering curriculum. Admiral Melville believes that an experimental station for the instruction of engineers, based on the German idea, should be established, and he asks for an appropriation of \$400,000 to carry out the idea. He declares naval engineers require a more advanced course than the academy affords and that with a new school that institution may be made the leading institution of its kind. In discussing his plan the admiral said:

"The grandest thing of the kind in the world, to my mind, is the experimental station at Charlottenburg, Germany. One reason why the Germans are today outstripping the United States, Great Britain and France is because of their experimental station at that place. They make experiments in oil, strength of materials and all that sort of thing. They never make experiments except under the supervision of specialists. Everything is worked out scientifically, and I believe that is the reason why Germany has come to the front. It does not matter what the article may be; it is sent to that station, worked out and placed on the ship afterward. I think there ought to be an experimental station in this country. It is the only way to turn out the proper kind of men. We need such a place at the naval academy, where the government is now spending over \$8,000,000 in the rehabilitation of that institution. The number of officers detailed for engineering instructors has been increased, but more instruction must be given.

"My idea is to make the naval academy an engineering school which will turn out as capable engineers as they do at the Institute of Technology, Cornell university, Stevens institute and other similar places of learning. We have several institutions in the country that are now turning out better engineers than the naval academy. This is because those institutions have a more modern engineering plant and are better equipped in the way of shops. Some of the outside institutions have more instructors and with a better plant the engineering curriculum must be better than the government school. The establishment of the engineering experimental station at the naval academy will help matters very much.

"During the last three years much thought has been given by naval officers and others as to the best means of increasing the scope and character of engineering instruction at the academy. Several years ago I recommended the establishment of such a station at New London, but since the passage of the personnel law I have come to the conclusion that it would be better to establish it at the academy. The appropriation for the building and equipment of this station should be additional to that allowed for the rehabilitation of the academy. The only thing I will do if congress establishes the department will be to detail engineer officers to conduct the work. I have asked the secretary of the navy to let me do this. The Boston School of Technology has several times as many tools as we have for teaching engineering. It is the same at Cornell. Recently I sent an officer to visit the leading technological schools and valuable information has been secured which will aid us in deciding upon the right kind of building. I shall take the magnificent experimental station in Germany in general as a model, but, of course, we shall adapt it to our own needs and necessities."

For navigation charts apply to the Marine Review.

SCOTTISH SHIP BUILDING LETTER.

Glasgow, Feb. 20, 1902.—In the issue of the Review for Jan. 2 I mentioned a new agreement that had been provisionally concluded by the Amalgamated Society of Engineers and other trade unions in the engineering trade with the Federation of Engineering Employers. This agreement was referred to the vote of the members of the trade unions for confirmation or rejection. The ballot terminated last week and the result was announced a few days ago. It shows a vote of 9,714 for, and 16,563 against, ratification. But this is not by any means regarded as conclusive, inasmuch as the total poll is only 26,277 out of a total membership of 110,000. It is assumed that the non-voters are willing to accept the agreement as they did not take the trouble to vote against it. And as the trade union officials believe it is the best possible arrangement that can be made for the men, there is little doubt that the matter will be put before them again. Meanwhile, the old conditions, under which the trade has been carried on since the great strike of 1898, continue in force. These "conditions" related to the general principle of freedom to employers in the management of their works, and disposed of the restrictions which the trade unions had previously placed on piecework, overtime, apprentices, non-union labor, and the employment of unskilled men at automatic machine tools. It was said at the time that some of these conditions had been forced on the unions at the point of the sword—that the men were compelled to accept the terms of the conqueror. It was also said that the unions were only biding their time to reverse the whole situation, and to bring the employers down in turn. The sequel has proved how erroneous were these assumptions. After four years' experience of the "conditions" of 1898, the trade union executives have proposed to enter into a binding agreement, which would ensure the preservation of these conditions in a more clear and definite form. The agreement is between the Engineering Employers' Federation on the one part, and the Amalgamated Society of Engineers (more familiarly known as the A. S. E.), the Steam Engine Makers' Society, and the United Machine Workers' Association, of the other part, all of whom were parties to the "terms of settlement" of 1898.

There seems to have been some misunderstanding among the men as to the real meaning of clauses relating to piecework and the employment of non-union labor. They have not realized that the new agreement will not only insure at least time-wages to an average worker, but that there is a guarantee by the federation that pieceworkers shall be rewarded by extra pay in proportion to the industry and ability displayed. If a man by his own skill can increase his output, he will get the benefit. The federation as a body engage that this shall be, and as to non-union labor, while they hold all employers free to employ what labor they like, they will not allow any member of the federation to dismiss union workmen for the sole purpose of converting his work into a non-union shop. When these points, and some others, are properly explained to the men, it is expected that they will ratify the agreement at a second ballot. Special interest is taken in the matter here, because not only is engineering connected closely with ship building and all our leading industries, but this is the headquarters of the Federation of Engineering Employers, whose organization extends all over the United Kingdom, and whose constitution and methods have formed an example to employers in other industries on both sides of the Atlantic.

This week has witnessed the launch of one, and the steam trials of another, addition to the extensive fleet managed by Elder, Dempster & Co. The launch was from the yard of A. Stephen & Sons of a steel screw steamer. This steamer, named *Burutu*, is 370 ft. by 44½ ft. by 26 ft., with a tonnage of about 3,900 tons and has been specially constructed to meet the largely increasing traffic between Liverpool and the west coast of Africa. Her cargo spaces are designed to suit general cargo, and cargoes of palm oil, mahogany and kernels. She is constructed to Lloyd's highest class, with three decks, cellular double bottom, and large engine power to insure about 14 knots speed, with accommodation on two decks for over 100 first and fifty second-class passengers. All the passenger rooms, as well as crew quarters, are exceptionally well ventilated. Large dining saloons and reading, writing and smoking rooms are provided for both classes of passengers. The decks are of teak, and the cargo appliances have been arranged for handling easily, among other things, mahogany logs of over 10 tons weight. A large refrigerating store of five compartments has been fitted in the after part. Electric light, steam stoves, electric bells, and fresh and salt water supply are fitted throughout the vessel. A sister ship is being built on the adjoining berth, and is almost ready for launching.

On the same day the steamer *Melville*, built by Robert Duncan & Co., Ltd., Port Glasgow, for Elder, Dempster & Co., went down the river on her official trial trip. After several runs an average speed of 12¼ knots was obtained. This vessel is of 7,000 tons deadweight, and of the following dimensions: 385 ft. by 48 ft. 6 in. by 29 ft. 9 in. molded. She has triple-expansion engines; cylinders 27 in., 43 in., 72 in., by 48-in. stroke; two boilers 15 ft. 3 in. by 11 ft. 6 in., 180 lbs. working pressure; Howden's forced draft; seven steam winches, and large multitubular donkey boiler. Besides the usual water ballast in double bottom and after peak, there is a deep hold tank abaft the engine and boiler space fitted with water-tight hatches and capable of containing about 1,000 tons of water (or about 2,000 tons in all), to which are connected powerful water-ballast pumps controlled from the engine room. The cargo capacity is about 400,000 cu. ft. and the capacity for bunker coal about 700 tons. Accommodation for the captain, officers and engineers is in steel houses on top of the bridge deck, comprising commodious saloon, mess room, state-rooms, bath rooms, etc., while above the saloon is built a large steel house, 16 ft. by 16 ft., for chart house, steering column, and a Thomson steering compass. Above this chart house is fitted a flying bridge, with steering and telegraphic connections and a Lord Kelvin patent standard compass. Steam heating is fitted throughout the saloon and captain's, officers', and engineers' rooms, and also to the pantry and baths, and a sanitary tank on the bridge deck distributes water to various parts of the vessel. A cattle tank is fitted on the bridge deck, and is connected by pipes from a distilling apparatus and the different fresh water tanks, in order to distribute fresh water along the vessel, fore-and-aft, when cattle or horses are being carried. Cattle doors are cut in the sides of the bridge space, and the poop, bridge and fore-castle erections are made to a height of 8 ft.,

beam to beam, and the sides are pierced and fitted with 10-in. brass side-lights, and also with Collinson's patent scuppers. Large gangway doors are fitted on each side of the bulwarks opposite each hatch, while in each hold in 'tween decks there are fitted large cargo ports for the convenient working of all kinds of cargoes. This vessel is fitted with extra-sized ventilators and an extra number to all the holds, extra water-tight doors, and an extra number of coaling hatches in bridge and main decks, ice-house in bridge of ample dimensions, additional fan engine for forced draft, increased height of all erections and engine and boiler casings, additional appliances for loading and discharging cargoes, and many other unusual fittings. The vessel is steered by a Roger's patent steam steering gear fitted amidships, and a powerful McBryde handgear fitted on the poop, and is classed in the British Corporation Registry of Shipping. It is expected that she will be engaged in the government service for some time.

We have had an interesting arrival in Scotland in the shape of the *Hecla*, which has been brought over from Norway to fit out for the Scottish Antarctic expedition. The *Hecla* is a smartly rigged ship of the ordinary whaling build, and is equipped with auxiliary steam. Her tonnage is 350 tons, her length 140 ft., beam 29 ft., and depth 16 ft. The *Hecla* will be rechristened and will receive a Scottish name. Her equipment for the Antarctic will be mainly supervised by Mr. G. L. Watson, the well-known Clyde yacht expert, designer of *Shamrock II*. It is expected that the vessel will be from twelve to twenty months on the expedition. Capt. Robertson, a trustworthy navigator of the Arctic and Antarctic seas, will be in charge of the vessel, which will carry a Scottish crew of thirty, including six or eight of a scientific staff. Mr. W. S. Bruce, the leader of the Scottish Antarctic expedition, says that while all the four expeditions to the Antarctic will undertake general geographical explorations, the German and British will concentrate their attention upon magnetism, whereas the Swedish will devote itself more to geology, and the essential feature of the Scottish expedition will be oceanography, both physical and biological. The *Hecla*, on which the expedition will be conducted, sails from Buenos Ayres in August. From thence she will proceed to Port Stanley, striking an easterly course to the Sandwich group, which it will explore and then sail southwards to explore the deepest known part of the Antarctic ocean. In this vicinity Sir James Ross in 1843 obtained a sounding of 4,000 fathoms, no bottom, and this sounding is more or less borne out by the results of the Valdivia expedition a few years ago, which took soundings from Bouneb island to Enderby Land, and obtained several soundings of over 3,000 fathoms. Our work, says Mr. Bruce, will be in this great Antarctic deep. The vessel will try to attain a high southern latitude, but not at the sacrifice of valuable essential work in a less high latitude. The vessel will be fitted on the Clyde with all the apparatus necessary for sounding, dredging and trawling, and will present a different appearance from the sealing and whaling look she has just now.

Apropos of the new work for the British navy it may be of interest to reproduce some notes of what other nations are doing. Russia has been especially active in the laying down of new ships, and preparations are now made for building five battleships of 12,000 tons. One of 13,600 tons with a smaller battleship has recently been commenced, while three of 13,000 tons were launched last year. Several cruisers are in process of construction or under contemplation. France has in preparation two battleships and an armored cruiser. Italy has laid down two new battleships of 12,625 tons and 22 knots speed, while two equally large vessels were launched last year. Austria has laid down an armored cruiser of 7,400 tons; Holland, two battleships; Norway, two small armored cruisers; and Turkey, three cruisers. America has undertaken the construction of six battleships and six armored cruisers. Japan has just finished two huge battleships built in Great Britain.

Of the contract vessels already laid down for the British navy, four battleships are to be completed for commission during the year, along with six armored cruisers. The four County cruisers—the *Berwick*, *Cumberland*, *Donegal* and *Lancashire*—are to be finished in the financial year 1903-4. Two battleships and five armored cruisers, with smaller craft, are to be laid down by the end of March. Of the four battleships to be completed next financial year, the *Thames Iron Works* are building the *Duncan* and *Cornwallis*, *Laird of Birkenhead* the *Exmouth*; and *Palmer & Co.*, *Jarrow-on-Tyne*, the *Russell*. The *Good Hope* has been completed by the *Fairfield* company before her time. The *Leviathan* promises also to be completed within her time by *J. Brown & Co.*, *Clydebank*. The *Monmouth* is building with the *London & Glasgow Co.* and the *Bedford* with the *Fairfield* company. These are all ships which are to be completed before March 31 of next year.

In addition there are in the royal dock yards a large number of vessels, according to the present arrangement, to be completed for commission within the next year. These include five battleships, three armored cruisers, two second-class cruisers, and two sloops. The battleships are the *London*, *Venerable*, *Bulwark*, *Albemarle* and *Montagu*. The three first-named are practically completed, two of them having passed through their trials, while the third is almost ready for trial. The *Albemarle* is completing at Chatham dock yard, and the *Montagu* at Devonport dock yard. The *Drake*, which belongs to the same class as the *Good Hope*, is also to be completed shortly, also the *Kent* at Portsmouth dock yard, and the *Essex* at Pembroke. Two second-class cruisers, the *Challenger* and *Encounter*, as well as the sloops *Odin* and *Merlin* are also progressing. The *Queen* and *Prince of Wales*, which have to be launched in March, must be well advanced during the next financial year, as they are to be commissioned in 1903, and the armored cruisers *Suffolk* and *Cornwall* are to be commissioned at the same time.

Besides all this, the admiralty are now considering tenders for two battleships complete, and engines and boilers for a third which is to be built at one of the royal dock yards; five armored cruisers complete, and the machinery for a sixth to be built at one of the dock yards; and ten 25-knot destroyers. Contracts for two third-class cruisers and four torpedo boats have already been allotted this year, though the particulars have not yet been announced, and two sloops have been ordered to be built at Sheerness dock yard. With regard to the third-class cruisers, it is in contemplation to fit one of them with Parsons' steam turbine machinery for comparison with the ordinary reciprocating engines in her sister ship. The whole ship building industry is on the qui vive until the admiralty contracts are definitely placed.

IRON AND STEEL WORKS IN NORTH AMERICA.

SINCE 1898 THE BLAST FURNACE CAPACITY OF THE UNITED STATES HAS INCREASED 33 PER CENT.—ANNUAL CAPACITY IS NOW 24,000,000 TONS.

Mr. James M. Swank, general manager of the American Iron & Steel Association, has brought the statistics of the iron and steel works of the United States and Canada up to date in the fifteenth directory, just issued by the association. The preface to the volume gives a complete account of the important additions which have been made to the iron and steel industries of America during the past few years. The preface is, indeed, a complete epitome of this great industry and is as follows:

The fifteenth edition of the directory to the iron and steel works of the United States presents to the American iron trade a thoroughly revised description of all the blast furnaces, rolling mills, steel works, and tinplate works in the United States; also of the few remaining forges and bloomeries. The iron and steel works of Canada are also described. It was intended to have this edition completed and in the hands of the manufacturers and others as early as Nov. 1, 1901, but unexpected difficulties arose while the book was being printed, resulting in serious delay in its appearance. These difficulties were of two kinds: first, notwithstanding the utmost industry upon our part, many manufacturers could not for many reasons promptly furnish us with the information they were asked to send us about their own works; second, changes in equipment, officers, etc., were constantly taking place, so that the printer's proofs had to be altered from day to day. Even after the principal part of the book had been completed and printed it was found necessary to add a supplementary chapter which would embody the changes that had taken place while it was going through the press. We have succeeded in giving to the iron trade a directory that is complete in all essential details down to the close of 1901, but at the sacrifice of the symmetry which we would have been glad to impart to it. On page 1, where the general descriptions begin, the reader will find the phrase, "corrected to Aug. 31, 1901," and on page 389, where the supplementary chapter begins, he will also find the phrase, "corrected to Dec. 31, 1901." The supplementary chapter shows how numerous and important are the changes in the American iron trade that can take place in a few months. Indeed the whole directory is a record of marvelous changes and even upheavals in every branch of the American iron trade since the appearance of its predecessor in the summer of 1898. The present edition of the directory is divided into four parts, as follows:

Part I, occupying 151 pages, is chiefly devoted to the presentation of a full list of the consolidations and reorganizations that have taken place in the American iron trade during the last few years, with a full account of their capitalization and of the properties absorbed by them, mentioning also the names of previous owners of the properties. The names of directors, executive committees, and other officers are given in full. Coal and iron ore mines, coke ovens, lake vessels, railroads, limestone quarries, and all properties other than iron and steel works that have been acquired by the consolidated or reorganized companies are fully described, as are the iron and steel works themselves. Some of the older manufacturing companies of the country, which have been neither consolidated nor reorganized, are also for special reasons included in Part I. All the iron and steel works and other properties of each consolidated, reorganized, or other company that is mentioned in Part I are described in one connected narrative, no matter in how many states they may be situated, and under a displayed title. In other words, a chapter is devoted to each company that is described in Part I. This is an entirely new feature of the directory.

Part II, occupying 164 pages, embodies a complete description of all iron and steel works in the United States that are not described in Part I. The arrangement in Part II is by states and districts, as in previous editions of the directory, but with this difference, that all the iron and steel enterprises in each state and district are grouped together, the furnaces coming first and then the rolling mills and steel works and forges and bloomeries. A complete list of recently abandoned iron and steel works, classified by states, is a feature of Part II.

Part III occupies seventy-one pages and is devoted to the classification by states of the iron and steel works of the whole country (except blast furnaces) according to their products—the Bessemer steel works, the open-hearth steel works, the crucible steel works, all the steel casting works, the iron and steel rail mills, the structural mills, the plate, sheet, and skelp mills, the tinplate and terne plate works, the cut-nail works, the wire-rod mills, and the wire-nail works. This classification will be found to be very convenient for ready reference.

Part IV occupies thirteen pages. While Parts I, II and III were passing through the press in the late months of 1901 changes were taking place in the officers of many of the companies whose works are described in its pages and some new enterprises noted in the directory as having been undertaken were completed. All these and some other changes which had taken place prior to Dec. 31, 1901, are fully noted in this part of the directory, so that the whole book may be regarded as complete down to the date mentioned. We have even noted some changes in officers, etc., that have since taken place.

This edition of the directory also contains a complete account of the iron and steel enterprises in the dominion of Canada which had been completed or undertaken down to Dec. 31, 1901, occupying eight pages. The names of officers, descriptions of plants, etc., are given in full detail, with proper geographical classification in each case. We have not thought it necessary in this edition to consider the iron and steel works of Mexico. We know of only one addition to the list of iron and steel enterprises of that country as it was given in the directory for 1898, and this enterprise is not yet in operation.

It will be seen that the arrangement of the new directory differs in some material respects from that of its predecessors, but the innovations have all been rendered necessary by the radical changes that have taken place in the iron trade itself. All the essential descriptive features of previous editions have been retained.

Blast Furnaces.—In the edition of the directory for 1898 we described 420 completed furnaces as being then active or as having been reported to us as likely to be some day active. We added, however, that we felt

certain that about fifty of these furnaces would never make another ton of pig iron, thus reducing the number of furnaces that were then active or likely to become active to 370. We gave the annual capacity of these furnaces as amounting in round numbers to 18,000,000 gross tons, not all of which capacity could, of course, be employed at the same time. In the present edition we describe 406 completed furnaces, either active or reported to us as likely to be some day active. Eliminating some of the furnaces in the latter category as being in our opinion dead for all time there remain less than 400 live furnaces today. But many of these are the largest that the world has ever seen. Their annual capacity we place in round numbers at 24,000,000 gross tons, an increase since 1898 of exactly 33 1/3 per cent. Our actual production of pig iron in 1901 was 15,878,354 gross tons. Since 1898 we have transferred fifty-eight furnaces to the abandoned, dismantled, or inactive list.

When the directory for 1898 appeared four furnaces were being built, two in Pennsylvania and two in Ohio. Today we enumerate twelve furnaces as in course of erection, of which two are in New York, one is in New Jersey, three are in Pennsylvania, one is in West Virginia, two are in Alabama, one is in Michigan, and two are in Colorado. In these figures for both years we do not include merely projected furnaces, or furnaces that had been undertaken and work upon which had been suspended.

Of the 420 furnaces described in the edition for 1898, seventy-nine used charcoal as fuel and 341 used anthracite and bituminous fuel. Of the 406 furnaces that are now described fifty-five are reported as using charcoal, five as using mixed charcoal and coke, and 346 as using anthracite and bituminous fuel. The decline in the number of charcoal furnaces will be noticed, but it is also worthy of notice that many of the charcoal furnaces that are still active are of large capacity. The annual production of charcoal pig iron is not decreasing, although it is decreasing relatively as compared with the production of pig iron with coke and other fuels. In 1900 Georgia and Tennessee produced 44,608 tons of pig iron with mixed charcoal and coke. This was a larger tonnage than the total production of pig iron in that year with anthracite alone, which amounted to 40,682 tons. In 1901 we produced 23,294 tons of pig iron with mixed charcoal and coke. The average annual capacity of the seventy-nine charcoal furnaces in 1898 was 12,119 gross tons, and the average annual capacity of the fifty-five charcoal and five mixed charcoal and coke furnaces that are now described is 14,179 tons. The average annual capacity of the mineral fuel furnaces in 1898 was 53,150 tons, and the average annual capacity of these furnaces today is 69,252 tons.

Rolling Mills and Steel Works.—In the edition of the directory for 1898 we enumerated 504 completed rolling mills and steel works and four in course of erection. In the present edition we enumerate 527 completed rolling mills and steel works, twenty-eight in course of erection, and one being rebuilt, making a total of 556. In addition the directory mentions one plant which is to be rebuilt and six plants that are projected.

Puddling Furnaces.—The number of puddling furnaces in April, 1898, each double furnace counting as two single furnaces, was 3,889. In November, 1901, there were 3,251 puddling furnaces. The highest number of puddling furnaces reported in any edition of the directory was in 1884, when 5,265 were mentioned.

Bessemer Steel Works.—The total number of completed Bessemer steel works in April, 1898, including two Clapp-Griffiths plants and one Robert-Bessemer plant, was forty-five, and the whole number of converters was 100. In November, 1901, there were thirty-five standard Bessemer steel works with eighty-one converters, one Clapp-Griffiths plant with one converter, two Robert-Bessemer plants with three converters, and nine Tropenas and "special" Bessemer steel plants with fifteen converters; total number of Bessemer plants, forty-seven; total number of converters, 100, the same number as in 1898. The increase in the number of small Bessemer plants in the last few years is noteworthy. Since April, 1898, seven standard Bessemer plants have been placed on the retired list, but the capacity of the remaining standard plants has been increased. The annual capacity of the completed Bessemer converters in April, 1898, was 10,633,000 gross tons; in November, 1901, the capacity of the built and building converters was 12,998,700 tons.

Open-hearth Steel Works.—In the directory for 1898 we described ninety-nine completed open-hearth steel plants, with 281 completed furnaces, and in the present directory we describe 112 completed plants, with 403 completed furnaces. In 1898 no new plants were being built. In November, 1901, twelve open-hearth plants with forty furnaces were building, one plant was to be rebuilt, thirteen plants were projected, and six furnaces were being added to existing plants. The annual capacity of the 403 completed and the forty-six building open-hearth furnaces, in ingots and direct castings, in November, 1901, was 8,289,750 gross tons, against 3,522,250 tons of the completed furnaces in 1898.

Growth of Basic Steel.—In the directory for 1898 we indicated the character of the product made at our open-hearth steel works, whether acid or basic steel, or both. Of the ninety-nine completed open-hearth plants in April of that year forty-three were prepared to make basic steel, and of ten open-hearth plants that were projected at that time a majority would probably make basic steel. In the present directory 167 open-hearth furnaces are described as making acid steel and 236 as making basic steel; total, 403 furnaces. The acid furnaces have an annual capacity of 1,874,650 gross tons of ingots and castings, and the basic furnaces of 6,415,100 tons.

Crucible Steel Works.—In November, 1901, there were forty-five completed crucible steel plants, three building, and one plant projected. The number of pots in the completed plants was 2,896, and the aggregate annual capacity of these plants was 175,000 gross tons of ingots and castings.

Steel Castings.—In 1898 there were forty-seven open-hearth plants which were prepared to make steel castings, and in November, 1901, there were fifty-six, but in the meantime the capacity of many of the old plants had been increased. The production of open-hearth steel castings has greatly increased since 1898. As already mentioned, the number of small Bessemer plants has also increased since 1898, all of which make steel castings. Steel castings are also made by fourteen crucible plants.

Rail Mills.—In the edition of the directory for 1898 we enumerated fifty-one rolling mills which were prepared to make standard, girder, light T, and other iron and steel rails. In the present edition we enumerate forty-five completed rail mills and three building.

Structural Mills.—The whole number of works which are now equip-

ped to manufacture all kinds of rolled structural material, including beams, beam girders, zee bars, tees, channels, angles, bridge rods, building rods, plates for bridge work, structural tubing, etc., is sixty-seven. This branch of the American iron trade, like the production of steel castings, has made marvelous progress since the appearance of our last directory. It has been a leading factor in the development of our open-hearth steel industry and in the enlargement of our Bessemer steel industry beyond the production of rails.

Plate, Sheet and Skelp Mills.—In the present directory we enumerate 223 completed plate, sheet, and skelp mills, thirteen building, and two projected. In the directory for 1898 we enumerated 230 completed, two building, one partly built, and one projected.

Tinplate and Terne Plate Works.—In April, 1898, there were sixty-nine completed tinplate and terne plate works, one building, and one projected. In the present directory we enumerate fifty-five completed works, seven building, and one projected.

Cut Nail Works.—In April, 1898, there were forty-six rolling mills which were devoted in whole or in part to the manufacture of cut nails and spikes, and in addition there were nine nail factories which bought their nail plate, the whole number containing 4,544 nail and spike machines. In November, 1901, there were forty-three works of all kinds which made cut nails and spikes, equipped with 3,385 nail and spike machines.

Wire Rods.—In 1898 we enumerated twenty-four completed wire-rod mills and one projected mill. In November, 1901, there were thirty-two completed wire-rod mills, four building, one rebuilding, and one projected mill.

Wire Nail Works.—In the edition of the directory for 1898 we enumerated seventy-nine completed wire-nail works and one works building. In the present edition we enumerate sixty-four completed wire-nail works, three building, one rebuilding, and one to be rebuilt.

Forges and Bloomeries.—The number of pig and scrap iron bloomeries not connected with rolling mills in April, 1898, was ten, of which several were then idle. The number enumerated in the present directory is eight, nearly all of which were active in 1901. The number of forges which make blooms directly from the ore is reduced to two, one in New York and one in North Carolina. The latter is idle.

Natural Gas.—In the directory for 1898 we enumerated ninety-four completed iron and steel works which used natural gas in whole or in part and two in course of erection, as follows: Forty-one in Allegheny county and twenty in other parts of Western Pennsylvania, with one building; two in West Virginia; seven in Ohio; and twenty-four in Indiana, with one building; total, ninety-six. The total number of works which used natural gas in November, 1901, was 110, and in addition seven works to use natural gas were being erected, as follows: Forty-three completed and two building in Allegheny county and twenty-four completed and four building in other parts of Western Pennsylvania; West Virginia, seven completed and one building; Kentucky, two; Ohio, eleven; Indiana, twenty-two; and Illinois, one.

Canada.—Canada now has fourteen completed blast furnaces, four building and four projected. The completed and building furnaces have an annual capacity of 958,000 gross tons of coke pig iron, 7,300 tons of charcoal and coke pig iron, and 125,000 tons of charcoal pig iron. The total annual capacity of all these furnaces is 1,090,300 gross tons. There are now in Canada eighteen completed rolling mills and steel works and two building. Of the steel works one makes steel in a special Bessemer converter, one makes Tropenas steel, and two standard Bessemer steel plants are being built; four make open-hearth steel, and one open-hearth steel plant is being built. The annual capacity in ingots and castings of the completed steel plants and of those in course of erection is as follows: Standard Bessemer, Tropenas, and special Bessemer, 301,400 gross tons; open-hearth, 537,000 tons; total, 838,400 tons. The annual capacity of the rolling mills in rolled products is 981,900 tons. The directory fully describes all these Canadian enterprises.

In June, 1898, Canada had only eight completed blast furnaces and one furnace was in course of erection. Only two or three of the completed furnaces could be called large furnaces. Since the date mentioned the Dominion Iron & Steel Co. has built four large blast furnaces and a large steel plant at Sydney, Nova Scotia. Other new iron and steel enterprises have in the meantime been undertaken in Canada, some of which are now in operation and others are approaching completion.

QUESTION OF CHICAGO RIVER CURRENT.

Several cases involving the question of the current in the Chicago river since the opening of the drainage canal are coming before the United States district court at Chicago. Owners of the steamer Worthington are very much interested in one of these cases tried last week. During the season of 1900 the Worthington, in passing up the south branch of the river with the current, came into collision with some canal boats moored to the south bank, doing them considerable damage. A libel was filed against the Worthington by the owner of the canal boats. Attorney Ray G. MacDonald, representing the steamer, filed a petition under admiralty rule 59, making the Sanitary District a party to the suit. In the petition it was alleged that the current at the time and place of the collision was in excess of the three miles per hour named in the act of the legislature under which the Sanitary District is organized, that the steamer starboarded slightly to avoid a pile driver moored to the north bank of the river, that the current caught her stern so that she failed to respond to her helm when it was put to port, and that she was carried down onto the canal boats. Witnesses called on behalf of the steamer testified that the current was in excess of three miles per hour, while the experts of the Sanitary District undertook to demonstrate mathematically from the readings of their gauges at Lockport, cross-sections of the river and other considerations that it was less than one and a half miles. The case will undoubtedly go to the court of appeals.

Directors of the Dominion Iron & Steel Co. have decided to make a new issue of \$10,000,000 of the company's stock, to be used for improving the steel works at Sydney, C. B., and making required additions to the plant. The whole of the amount has already been underwritten by Canadian banks and will be issued to the public as soon as the necessary legislation is obtained from the Nova Scotia legislature. David Baker has been appointed to succeed A. J. Moxham as general manager of the company's works.

SCHOONERS ARE PROFITABLE.

(From the Boston Journal.)

The great four, five, and six-masted schooners of the Atlantic coastwise service, even in these times of sharply reduced freight rates, are among the most profitable floating property in the world, considering the investment involved. One schooner, with a gross tonnage of 1,904 and a carrying capacity of 3,000 tons, has made twelve voyages in 512 days, and paid a dividend on the twelve trips of \$442 for every one-sixty-fourth share, or nearly 39 per cent. on her cost of \$72,960. Thirty-nine per cent. is a profit which not even copper mines equal, and the owners of this successful schooner now have their ship quite as good as ever, for these modern coasters of massive construction keep their A1 classification for a dozen years. Three other vessels paid an average dividend of \$33 for every one-sixty-fourth share each trip, and an annual profit of 27.5 per cent. on the investment. Their net earnings were 42.9 per cent. of their gross receipts, and the profit repaid 19 per cent. of the total cost of the vessels.

Of course, these instances were more or less exceptional. There were many other coasting craft which, because of hard luck or smaller size, made a far less favorable showing. Yet it is a fact that, as things now stand, the great sailing schooners of the American merchant marine are as safe and attractive an investment as can be found in the United States. Their business is absolutely guaranteed to them. Cheap wage, subsidized foreigners cannot interfere with it. No alien vessel under any circumstances is permitted to enter the United States coasting trade. On the other hand, whenever freights are good, these huge fore-and-afters can take a charter over seas. Many of them have voyaged to South America or Europe. Some have gone to the other side of the world. They have proved that they are well adapted to deep-sea service.

Twenty-five years ago a full-rigged ship of 2,000 tons was considered a very heavy vessel. But there are now afloat eighteen American five and six-masted schooners of above 2,000 tons. The following facts, gathered by John S. Rand of Portsmouth, N. H., show some interesting points in the Atlantic coasting trade:

There are 377 schooners of over 500 tons gross register owned on the Atlantic coast.

The largest two-masted schooner is the Oliver Ames, 465 tons gross.

The smallest four-masted schooner is the Massachusetts, 591 tons gross.

The largest four-masted schooner afloat is the Frank A. Palmer, 2,014 tons gross.

The largest three-masted schooner on the ocean is the Bradford C. French, 968 tons gross.

The smallest five-masted schooner on the high seas is the Gov. Ames, 1,778 tons gross.

The largest five-masted schooner in the world is the Prescott Palmer of Boston, which registers 2,811 tons.

The largest schooner in the world at the present time is the Eleanor A. Percy of Bath, Me. She registers 3,410 tons gross and has six masts.

The only other six-master afloat is the George W. Wells of Boston; she registers 2,970 tons gross.

The new seven-masted schooner building for John C. Crowley will be the first steel schooner ever built in this country and the first seven-master ever built in the world. She will carry a cargo of 7,500 tons, spread 43,000 sq. ft. of sail, and be handled by a crew of only sixteen men, owing to many devices for saving labor.

The following table gives the name and gross tonnage of the twenty-nine largest schooners in the world:

Names.	Gross Tons.
Eleanor M. Percy, six masts	3,401
George M. Wells, six masts	2,970
Prescott Palmer, five masts	2,811
Baker Palmer, five masts	2,792
William C. Carnegie, five masts	2,663
Rebecca Palmer, five masts	2,556
John B. Prescott, five masts	2,454
Nathaniel T. Palmer, five masts	2,440
Oakley C. Curtis, five masts	2,374
Helen W. Martin, five masts	2,265
Fannie Palmer, five masts	2,254
Louise B. Crary, five masts	2,231
Arthur Seltz, five masts	2,207
Martha B. Small, five masts	2,178
Mary W. Bowen, five masts	2,153
Van Allens Boughton, five masts	2,120
M. D. Cressey, five masts	2,114
Frank A. Palmer, four masts	2,614
Jennie French Potter, five masts	1,993
Marie Palmer, four masts	1,904
Mary M. Barrett, five masts	1,833
James W. Paul, Jr., five masts	1,818
Henry O. Barrett, five masts	1,807
William B. Palmer, four masts	1,805
Gov. Ames, five masts	1,778
Jacob M. Haskell, four masts	1,778
S. P. Blackburn, four masts	1,756
Maude Palmer, four masts	1,745
Malcolm Baxter, Jr., four masts	1,732

It is announced from South Bethlehem, Pa., that the 125-ton stroke steam hammer, built by the Bethlehem Steel Co. in 1891 for its armor plate department, is being dismantled. The hammer, the largest ever constructed in the world, had not been in use for many years because of its turning everything topsy-turvy at the steel works. It is now being converted into scrap iron. The hammer stood four stories high and cost a fortune, but could not be used because it jarred all the other machinery out of plumb. The combined weight of piston head and tub in this hammer was 125 tons and the diameter of steam cylinder 176 in. The cylinder, in three sections, weighed 56,287 lbs. The working pressure was 120 lbs., with a stroke of nearly 20 ft. The metal of the anvil blocks weighed 2,150 tons. The hammer was built 70 ft. high above the floor level, with a span of 38 ft.

AN ADVOCATE OF THE SUBMARINE.

Mr. Archibald S. Hurd contributes a lengthy article to the "Nineteenth Century and After" upon the subject of the submarine boat. He is at the outset a firm believer in the submarine and thinks that it will be adopted by all the navies, notwithstanding the fact that many naval leaders think the submarine is, as yet, in an experimental stage. In part he says:

The submarine has come and it has come to stay, not only in the British navy but in the navies of the world. On the one hand it is true that we have the opinion of Rear Admiral O'Neil, chief of the bureau of ordnance of the United States navy, that this type of war craft has not yet passed beyond the experimental stage. On the other we have the action of the French authorities in acting in advance of the views which naval experts of the French fleet have expressed as to the capabilities of these boats. There is good authority for the statement that a steamship is now under construction on the other side of the channel to act as "mother-ship" to the submarines, or one flotilla of them, for it has been arranged that they shall be distributed in three groups. No provision is at present made in the estimates for this vessel, nor is she at first sight very different from an ordinary merchant ship, except that she is being fitted with special derricks whereby submarine boats can be lifted from the water and carried from point to point as desired by the admiral commanding the fleet, the officers and men in the meantime enjoying all the warmth and comfort to be had only in a large vessel; and reserving their strength until the moment arrived at which they could man their craft, launch them, and play their deadly role, whatever it might be.

Which shall we believe, the actions of the French in sinking national capital of no mean amount, or the theoretical views of some British and American officers, who have not had as many opportunities for specially studying this new type of man-of-war? While we profess to laugh at the submarine boats, we have built five, not because we expect that they will add to the gaiety of nations, but because the British authorities know that the submarine has come to stay, and that the French inventive instinct is leading the authorities on the other side of the channel with that unerring rectitude which has made them pioneers in methods of naval warfare. It is impossible to believe that successive ministers of marine have continued to build these boats well knowing, after experiments spread over several years, that they have no future, and that when hostilities occur they will prove of no use. Hitherto the problem of submarine navigation has been largely academic, and powerful and sufficient reasons have led the admiralty to ignore it. British opinion has always been skeptical, and for the best of causes; it has not desired that the obstacles to this form of warfare should be surmounted. Officially we do not want the submarine to succeed, and when failure is foretold it is to be feared that the wish is father to the thought. National sentiment in this country is against the submarine. National interests are also opposed to the submarine. We have invested all the insurance capital for the empire in large ships. They are the invested funds of the empire, they represent about £60,000,000, and wherever the British flag flies one of these armed citadels is not far off.

If the submarine has come to stay, as is asserted, then it is a menace to the battleship and the cruiser, and will minimize the effective power of such vessels. It is folly to sweep aside the claims which are made for the submarine even if they are exaggerated. Though they were unsupported by reliable evidence they constitute a menace to the morale of the crews of ships opposed to them. The submarine has reached a stage—even if only an "experimental stage," to quote Admiral O'Neil—when it becomes a menace; for it is no secret either here or in France that this craft is directed against the naval forces of this country. As is already known, the five British boats have been built under license from the Holland company, who are the pioneers in this class of construction in the United States, and they do not differ materially from the new craft which are being built on the other side of the Atlantic, and have raised so much contention among naval officers.

In view of the division of opinion that undoubtedly existed early in 1901, the decision last spring revealed the wisdom that may always be expected from the American naval department, but it must be understood that it reflected not at all on the possibilities which these boats suggest, and merely indicated that the American authorities would not take a leap in the dark, but were determined to await developments. Those developments have come, and they will assuredly be followed by orders for further boats of the Fulton type. None of the opinions expressed on submarine boats in this country, in America, or in France apply to the new type of Holland boat. It differs fundamentally from the French craft in that it does not sink slowly on an even keel, an operation that takes from 14 or 15 minutes to 20 minutes, but dives like a porpoise beneath the water within fewer seconds than the French submarines take minutes. It is, in fact, calculated—and was demonstrated in America during November last—that the British boats will be able to dive, so as to leave only their small armored conning towers visible on the surface, in a matter of a few seconds, and in this position they will be able to travel if necessary 400 miles; none of the French boats can approach this achievement. As to the rate at which the new Holland type of boat is capable of submergence, it is noteworthy that during the recent trials of the Fulton she was able to dive in from two to three seconds entirely out of sight, so that, at a moderate range of, say 2,500 yards, she could have submerged herself out of danger of a shot after seeing the flash of the gun on firing. With reference to the air supply, this has given trouble in some of the French boats, and the crews have suffered much inconvenience. There will be no difficulty in the new Holland boats, which are fitted with apparatus for purifying the atmosphere and have a large storage of compressed air. These arrangements are so perfect that one complement remained sealed up in a boat for several hours smoking and singing lustily; indeed the air supply is sufficient to enable the crew in face of any imminent danger to remain submerged for 36 hours without discomfort. To some extent this claim has been put to the test. On Nov. 5 the Fulton, which is similar to the British boats, remained under water for 15 hours without discomfort to the crew.

Whenever the subject of submarines is raised, skeptics point to their alleged blindness. At one time there was ground for the contention that these craft cannot see beneath the water. The French have surmounted this difficulty to some extent by the use of what is known as the periscope. Of the utility of the periscope under favorable conditions there can be no doubt. It has enabled several of the French submarines to operate with

success while remaining themselves unseen. We have the assurance of Lieut. Dawson that each of the British boats will have "a special arrangement for effecting this purpose" (obtaining a view of the surface) "while enabling her to run at distance below the surface so that no visible trace of her can be seen." "Such an arrangement," he adds, "places this country quite on a level with the French nation, notwithstanding the fact that we may not have given the same amount of attention to marine warfare."

Admiral Philip Hichborn, until recently chief constructor of the United States navy, has laid down the desiderata in a submarine boat. Summarizing his views he stated that the "Holland type of submarine in its present development is a large positive quantity, and there seems to be no way of largely increasing it for some years." In this prophecy, though expressed only 18 months ago, this officer was wrong, for already the boats have been given sight when submerged, as indicated by Lieut. Dawson, while the latter expresses the view that, though the speed is not great, progress is certain, and attention may be directed to the following significant parallel: When the Whitehead torpedo was first introduced it had a low speed, and, generally speaking, was very uncertain as to its direction, depth, and applied utility. Now, however, it is capable of running within a few inches of the required depth at a speed of some 37 miles an hour for a range up to 2,000 yards, and hitting the point aimed at with almost the same precision as a gun. In the same manner, there is no doubt, the submarine boat will be improved, while there is a great field for development in connection with the secondary battery.

In view of the fact that Admiral Dewey is one of the half dozen officers of high standing who have had experience of war under modern conditions, it is remarkable that so little attention has been paid to his opinion on submarines. Those who view the subject without prejudice will agree that Admiral Dewey has adopted the right attitude towards these new engines of war. Since without our seeking, and in spite of British discouragement and incredulity, they have forced their way into five of the greatest navies in the world (for Russia and Italy are building specimens), it behooves all the powers not merely to carefully regard their future development, but to familiarize crews with their construction, equipment and management. This can be done only by building a number of these craft, and we have every reason for congratulation at the action which the British admiralty have taken. Admiral O'Neil since he made his reference to the submarine being still in an experimental stage, has admitted that he is already satisfied that these vessels are a most important development for harbor and coast protection. The long runs which have been made by several boats in an open seaway in French and American waters give reason to believe that in the near future their role as an offensive force may be also amply established. The future is in the lap of the gods, but already the submarine looms large, and it would be rash to attempt to mark the limits of its employment in time of war. We may be on the eve of a naval revolution almost as momentous and as far-reaching in its results as the change from wood and sails to the steel and steam of today. Under the influence of the demonstrations that have taken place in America and off the French ports the naval opinion of the world has been undergoing a gradual change, and it must be recognized that as the submarine now promises to become a formidable engine of war, and is also an instrument of commerce like other war-like material, its future development along the lines of the present models is certain. If one can read aright the signs of the times, in a few years the French navy will have not thirty-four, but probably ten times as many submarines wherewith to protect the ports of the republic, and to lead attacks on our commerce maybe; in the last resource, if bolder tactics fail, carrying on a species of guerrilla warfare in the English channel similar in some measure to the operations that the Boers have pursued with so much success in South Africa. Fully 90 per cent. of the merchant ships that are ever passing up and down this narrow waterway fly the British flag. How narrow the channel is, and what an admirable field it offers for commerce destruction, the people of this country apparently fail to recognize. A hundred submarines let loose at sunset in these narrow waters would render existence on our warships by no means enviable. The field for operation in the Mediterranean is hardly less favorable to these boats.

The French people have long ago assimilated these possibilities, which are responsible for the enthusiasm with which the submarine has been welcomed. Frenchmen know that it has come and has come to stay, a thorn in the side of the greatest naval power with its hundred millions sterling invested in battleships and cruisers, more or less at the mercy of these ships, deadly in their threat though insignificant in size, and cheap. The old policy of refusing to admit that submarines are or can be of any service to a power that intends to pursue an offensive-defensive scheme when war occurs must be abandoned, since there can be no doubt that the new vessels will be of the greatest service for harbor and coast defense if only on account of their moral influence. This has been already proved by the Narval, Morse, and Gustave Zede in France and by the old type of Holland boat which has been most thoroughly tested in America. The right line of action was set forth by the secretary to the United States navy when he informed congress that "well trained and thoroughly reliable crews are indispensable for submarine boats, and like all torpedo boats their efficiency will largely depend on the nerve, dash and steadfastness of their personnel." This marks the accurate attitude towards the submarine boat in its present stage—a desire to ascertain its powers, and a recognition that this can be done only by detailing officers and men to the craft, and giving them every opportunity and encouragement to test the capabilities of this audacious development of naval warfare. So far as can be judged this is the line of action that the British admiralty have laid down, and this way lies truth as opposed to theoretical condemnation or over-appreciation, both of which are fraught with danger.

The Algoma Tube Co., Ltd., has been incorporated at Toronto. The new company, which is one of the Clergue industries, and which will be located at Sault Ste. Marie, has a capitalization of \$30,000,000. The incorporators are E. V. Douglas, W. Douglas, F. S. Lewis, J. S. Freeman, F. H. Clergue and H. C. Hamilton. The company proposes to manufacture metallic tubes and is also authorized to acquire from the Perrins Co., Ltd., certain patents held by that company.

The New York assembly has reported a bill providing an appropriation of \$37,200,000 for canals.

BRITISH NAVAL PROGRAM.

The Engineer of London, in discussing the British naval estimates, says that they provide a net total of £31,255,000, being an increase of only £380,000 over the appropriation for last year. During the current year four battleships of the Formidable class and the Vengeance will have been completed and passed into the fleet reserve; four armored cruisers of the Cressy class; the first-class protected cruiser Spartiate; the third-class protected cruiser Pandora; the royal yacht Victoria and Albert; twenty-two destroyers, five submarine boats and other details. The homogeneous character of the battleships and armored cruisers renders them a peculiarly satisfactory increment in strength with a view to their forming part of the Channel or Mediterranean squadrons. This fact is commented on in the first lord's statement. Independently of these vessels there will be under construction on April 1 next thirteen battleships, twenty-two armored cruisers, four other cruisers and ten destroyers and other details, out of which number five battleships, seven armored cruisers and six details will be completed and passed into the reserve during the coming year. It is proposed to commence during the financial year 1902-3 two battleships, two armored cruisers, two third-class cruisers, four scouts, nine destroyers, four torpedo boats and four submarines. But a very important feature of this part of the new program is the plan of reconstruction which has been decided on, and in which great progress will be made during the year. The battleships of the Royal Sovereign class are to have the upper deck guns protected by casemates, a most valuable modification, as hitherto the protection of these gun positions was most inadequate. Another excellent arrangement is the exchange of the 4.7-in. quick-firing guns of the Centurion and Barfleur for 6-in. weapons in casemates. Four 6-in. quick-firers will also be added to the armament of the Terrible and Powerful. All the 4.7-in. guns of the Arrogant and Talbot classes are also to be replaced by others of 6-in. caliber. It is a little difficult to see how these increased weights of armor and armament can be carried upon the vessels indicated without an increase of displacement or a reduction of the coal supply carried; but a certain amount of latitude, or admiralty margin, is always given in allowing for weights on board, and probably coal and extra stores will be cut down a little without doing any great harm. The changes are, however, imperative, and will be hailed with satisfaction by naval officers.

The new class of cruiser to which the name of "scout" is to be given, comes in somewhat opportunely after the reading of a valuable paper at the spring meeting of the Institution of Naval Architects by Admiral C. C. Penrose Fitzgerald, entitled "A Design for a Fast Scout." Lord Selborne did not give any of the proposed dimensions for the future type, but said that he should invite the private ship builders of the country to give the navy the benefit of their creative ingenuity by submitting designs to fulfil certain stated conditions. Singularly enough the working out of Admiral Fitzgerald's design was taken in hand by Mr. Philip Watts of Elswick at the time, but now director of naval construction at the admiralty. Possibly the adoption of such a type for the British navy may have been the outcome of the admiral's idea. If so it is suggestive of a happy augury for the future when naval officers and naval constructors will be found working out, side by side, their suggestions for coming naval types. The design for a "fast scout" above alluded to was a vessel of 3,800 tons, capable of steaming 25 knots, but having an actual sea speed of at least 23 knots at three-quarters power. Mr. Philip Watts expressed his confidence that such a speed could absolutely be maintained with the design in question. A light armament was to be carried of 4-in. quick-firers, but the vessel was intended to reconnoiter, and not to fight. We heartily endorse Admiral Fitzgerald's views as to the importance of such a type, and admiralty opinion appears now to have distinctly taken a turn in this direction, although Sir William White was much opposed to it at the time when the paper was read at the meeting of naval architects. Perhaps, however, the invitation to the trade may produce some type considerably faster than the 25-knot scout. At the Glasgow exhibition a model appeared, ostensibly intended for a channel steamer, but in reality of under-water form very similar to a large "destroyer." It was designed by the Parsons Co., Ltd., having turbine engines, with eight propellers on four shafts, the indicated horse power being 18,000, or 1,000 more than the admiral's "scout," while the length was 275 ft., beam 30 ft., and estimated speed 30 knots. A modification of this vessel with greater length, greater beam, and a fuller midship section, would probably maintain 26 knots in a sea way, and could run away with ease from the fastest cruisers that have yet been built.

The number of officers, seamen, and engine room ratings is to be increased by 3,875, thus raising the total for the coming year to 122,500. Considerable modifications are to be made in the position of officers of the medical branch of the navy. The great impetus which has been given to the status and working of the army medical department, and the improved condition of service for the officers belonging to it, have shown that something must be done in this direction for the navy. The result will be better pay, positions, and allowances for the officers concerned.

FISHERIES OF CANADA.

The fisheries of Canada constitute an industry that does not always receive the attention it is deserving of as a contributor to the national wealth. It figures in the export tables for the last fiscal year for \$10,720,352, which is the large proportion of one half of the total value produced. This in the year 1900, which the statistics in the annual report of the department cover, was \$21,557,639, a decrease of \$334,067 from the record of 1899, but greater than the average of the last ten years. Divided among the provinces the production was as follows:

Nova Scotia	\$7,809,152
British Columbia	4,878,820
New Brunswick.....	3,769,742
Quebec	1,989,279
Ontario	1,333,294
Prince Edward Island.....	1,059,193
Manitoba and territories	718,159

Nova Scotia's lead is a natural one. Her fishermen are within easy reach of the haunts of the herring, the mackerel and the cod, and her shores are still frequented by the lobster, which stands high in the list as a source of wealth. British Columbia owes her position in second place to the salmon, which rush to her rivers with a regularity and in numbers that make one of the wonders of marine history. Salmon lead in the list of the value of fish taken, the figures given being \$3,893,217, cod being set down for \$3,614,775, lobsters for \$3,055,350, herring for \$1,853,237, and mackerel for \$1,549,448. None of the other fish reach the million dollar mark. A noteworthy fact is that, in spite of the talk about the catch being pursued too eagerly, the value of lobsters taken was nearly \$200,000 greater than in 1899. This was due, not to the work of the packers, but to the growth of a trade in live lobsters between western Nova Scotia and United States markets. The report refers to this as a movement to be encouraged, only the larger sized lobsters being of use. Another developing branch is the halibut fishery on the Pacific coast, where a growth in value of \$130,000 is noted in a total of \$405,963. The capital invested in the industry is very considerable, being put down at \$10,990,125. The lobster plant is valued at \$1,419,100, while the British Columbia salmon industry is credited with establishments valued at \$1,420,000. Altogether some 80,000 men were employed at least for a part of their time in the work of the fisheries, and made use of 1,200 schooners, 38,930 boats and 6,295,000 fathoms of net, so that the indirect employment is also large. The government expenditure, on administration, fish culture, protection, etc., during the year covered by the report was \$491,569, there being received in this connection from various sources a return of \$98,178. There was also a payment of bounties to the deep sea fishermen of the maritime provinces of \$158,802, there going to the crews of 802 fishing schooners a sum of \$68,721, the rest being distributed among 22,031 boat fishermen. It would not seem from the latter figure that the bounties are any great encouragement to an industry that shows such large results.

DREDGING THE HARBOR OF MANILA.

Mr. August Nelson of Boston has been selected to superintend the dredging of a harbor for the port of Manila. He is connected with the Atlantic, Gulf & Pacific Co., to which a contract was awarded by the United States government last August for about \$2,000,000. A few skilled mechanics will be engaged in this country, but the main work is to be done with native labor. Some 200 men will be employed in Manila during the first part of the work. Construction machinery has already been shipped; three or four barges are being built on the island for carrying granite, and the excavated material and a large quantity of Oregon pine, to be furnished by the United States government, is being prepared for shipment. The site of the proposed harbor is in Manila bay, in front of the walled city. It will have a depth of 30 ft. at low water. The area to be dredged is 3,600 ft. wide in front of the busiest part of the city. It extends 6,700 ft. out to sea, where the water is already deep enough to satisfy the demands of the shipping business. In connection with the deepening of the harbor bottom the company will complete the breakwaters which the Spaniards started, and also construct coal pockets near one of the landings. According to the specifications all the various improvements in the harbor are to be completed within two years and six months from next July.

A favorable report has been made on the bill authorizing the government to construct a cable across the Pacific ocean. The entire cost of the cable, including ships and all possible contingencies, is estimated at \$10,000,000.

J. H. Graham of the Graham & Morton Transportation Co., Chicago, purchased the steamer C. W. Moore at marshal sale in St. Joseph Tuesday for \$5,000.

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"LA LORRAINE" (new)	Twin Screw	15,000 tons	22,000 H.P.
"LA SAVOIE" (new)	"	"	"
"LA TOURAINE" (modern)	"	10,000 "	12,000 "
"LA AQUITAINE" (modern)	"	10,000 "	16,000 "

Naval officers command above steamers, insuring the same strict discipline as on a man-of-war. These ships all have double bottoms and water-tight compartments, and prescribed routes are taken to avoid fogs. The above steamers contain every modern twentieth century equipment for safety, most luxurious accommodations, and the cuisine is famous. The favorite route of the elite of both continents. For rates, plans and other particulars apply to

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LAUNCHES AT LAKE SHIP YARDS.

The wonderful progress that is being made in the different yards of the American Ship Building Co. with the thirty or more large steel freighters which they have under way is undoubtedly due in part to the fact that so many of the ships are duplicates. This is what has given rise on the lakes to the term "manufacture" of ships. At Lorain on Saturday last the fourth of five steamers building for J. C. Gilchrist and others was launched. Beside her on the stocks was the fifth boat. Fifteen days had elapsed since the keel of this vessel was laid. She was not only entirely in frame but had considerable of the plating attached. This is certainly rapid work on a ship that is to carry 5,600 gross tons and cost about \$240,000. Of course, the great bulk of the bottom structure and frame was riveted up and ready to be put in place immediately following the stretching of the keel. One of the steamers for the Hawgoods of Cleveland is now going down on the berth vacated by the fourth Gilchrist steamer and another Hawgood boat will follow the fifth Gilchrist steamer, which will be launched in about four weeks. The management of the Lorain works has found that better results are obtained by working on only two of the 5,000 or 6,000 ton freighters at one time. The yard space would permit of working three large ships without difficulty, but the best practice is to concentrate the yard force on two vessels under the main crane service. With proper management the yard workmen can in this way keep up with the capacity of the punch shop, etc. The Gilchrist steamer launched on Saturday last was named C. W. Watson, in honor of the president of the Fairmount Coal Co., one of the large soft coal concerns of West Virginia. Mr. Watson was unable to be present at the launching, but was very well represented by Miss Grace C. Saunders of Cleveland, daughter of Mr. A. C. Saunders, who had been accorded the honor of christening the ship and who made the occasion one of some ceremony and considerable pleasure for a party of friends. These five new ships of the Gilchrist fleet are duplicates in all respects. Dimensions are: Length over all, 400 ft.; keel, 380 ft.; beam, 50 ft.; depth, 28 ft. Engines are triple-expansion, with cylinders of 22, 35 and 58 in. diameter and 40 in. stroke. Boilers are of Scotch type, 13 ft. 2 in. by 11 ft. 6 in., two in each boat, fitted with Howden draft and built for a working pressure of 170 lbs.

At Buffalo on Monday the American company launched another of the five steel freighters building for the United States Navigation Co., of which Capt. W. W. Brown of Cleveland is general manager. This steamer was named for Wm. Nottingham of Syracuse, one of the principal stockholders of the United States company, and was launched by Mrs. Florence A. Nottingham. The Nottingham is 400 ft. over all, 358 ft. keel, 50 ft. beam and 28 ft. depth. She will carry about 5,600 gross tons. Her triple-expansion engines have cylinders of 22, 35 and 58 in. diameter, with 40 in. stroke. Two boilers of Scotch type are 13 ft. 2 in. by 11 ft. 6 in., built for 170 lbs. steam pressure, and are to be fitted with Howden draft.

Mr. Edward Gaskin, formerly manager of the Union Dry Dock Co., Buffalo, has been spending some time in Toledo of late. He is looking after the construction of the oil tank steamer building at the Craig works for the Sun Oil Co.

Sultana and Sonora are the names selected for the two large steel freight steamers which the American Ship Building Co. has under way for G. A. Tomlinson of Duluth.

TRADE NOTES.

The New York Belting & Packing Co., New York, is equipping the steamer Virginia, building at the William R. Trigg Co.'s works, Richmond, Va., with interlocking rubber tiling.

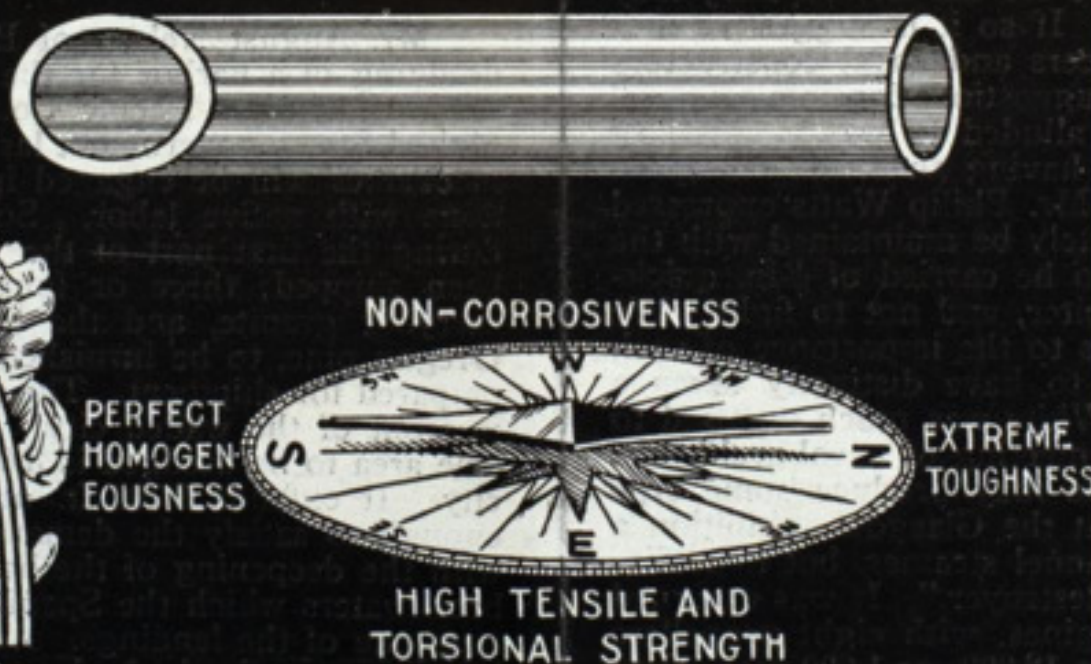
Messrs. Quigley, Davis & Dorp, Cooper's point, Camden, N. J., have added one of the large band sawing machines made by the Atlantic Works, Incorporated, of Philadelphia, to their ship yard equipment.

Mr. W. C. Farrington, vice-president and general manager of the Northern Steamship Co., has ordered from Robert Learmonth of 200 Lafayette avenue, Buffalo, the Buffalo feed water heater and purifier for the Scotch boilers that are being installed in the large passenger steamers North West and North Land.

The Buffalo Forge Co., Buffalo, N. Y., is building a very large fan to be used for mine ventilation by the Modoc Coal Mining Co. of Gloucester, O. The fan has a 250-in. housing of the three-quarter type, and is constructed throughout of steel plate rigidly stiffened and braced. The blast wheel or rotating element of the fan is of special design. It is to be driven by a direct-connected horizontal engine at a speed in the neighborhood of 150 revolutions per minute. The fan will deliver 125,000 cu. ft. of air per minute at ordinary working speed. This is one of many typical mine ventilating plants which are constantly being built and installed by the Buffalo company.

Wilson & Silsby, sail makers, New York, have orders for 100 new suits of sails, including those for the yachts Scimitar, Ruth, Paukewis, Lady Mary, Torpedo, Dragoon, Pantooset, schooner Agatha, Malillian, 25-footer, Neriad, 21-footer, Christina, Senta, 21-footer, Micmic, 21-ft. race-about, 35-ft. yawl for Bancroft Davis, 21-footer, 21-ft. knockabout, yacht Volipsi, 26-footer for R. H. Lee, Devon, Eng.; schooner for Arnold Lawson, sloop for H. C. Morse, 25-footer, Cherokee, 30-footer, 25-ft. yawl, 60-rater for H. F. Lippitt, the Pirate, 21-ft. knockabout for Mr. Pugh, Pasadena, Cal.; ice boat Ariel, 21-footer, Helen, Daniel Crosby & Son, yawl; George Lawley & Son, 18-footer for Alfred Douglass, Tam, Lemoine & Crane, 21-ft. raceabout, and 30-footer; G. R. Liljegren, 38-foot L. W. L. cutter for O. Mark, Gothenburg, Sweden; 21-ft. raceabout for Mr. Henry B. Rogers; Tams, Lemoine & Crane, 26-ft. sloop; Arthur Binney, 30-ft. yawl for Mr. Foss, and 46-ft. yawl; J. A. McKee, 21-ft. raceabout; George Lawley & Son, 25-footer; James Andrew, Oakville, Ont., 38-ft. racing cutter, and Charles W. Cole, 18-footer.

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They positively resist electrolysis.

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Their manufacture has long since passed the experimental stage.

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The basis of the high non-corrosiveness of "Benedict-Nickel" is its inert nature due to the combining of nickel with copper. The metal contains no zinc nor any other weakening metal. It is perfectly homogeneous.

The tubes are hot-rolled from solid cylindrical billets, not cast on a core, and given a twist formation like that of a gun barrel. Hence their great tensile and torsional strength.

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SHIP BUILDING DURING FEBRUARY.

The bureau of navigation, treasury department, reports forty-six vessels of 8,607 gross tons built in the United States and officially numbered during February, as follows:

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and gulf.....	26	1,793	10	459	1	3,381	2	739	39	6,372
Porto Rico.....										
Pacific.....	3	1,820	3	409					6	2,229
Hawaii.....										
Great lakes.....			1	6					1	6
Western rivers.....										
Total.....	29	3,613	14	874	1	3,381	2	739	46	8,607

The largest vessel in this list was the sailing ship Atlas of 3,381 gross tons, built by Arthur Sewall & Co., Bath, Me., for the Standard Oil Co.

PRAISE FOR COM'DR WILSON.

The Lake Carriers' Association, through its executive officers, has just extended to Com'dr J. C. Wilson, U. S. N., until recently inspector of the Eleventh lighthouse district with headquarters at Detroit, a very earnest acknowledgment of ability and efficiency. A letter to Com'dr Wilson from Capt. George P. McKay, treasurer of the association and chairman of the committee on aids to navigation, is as follows:

"On account of the very pleasant personal relations which I have had with you in connection with lights, buoys, etc., of the Eleventh lighthouse district, it affords me the greatest pleasure to be able to say that at a joint meeting of the executive committee and the committee on aids to navigation of the Lake Carriers' Association, I was, by a unanimous vote, instructed to officially express to you the sincere regret of the Lake Carriers that you are to leave that district, because we have invariably found you not only active and earnest in the interests of the government service, but always so reasonable and so ready to have your attention called to matters which our practical pilots reported to us, and we have seen plainly that your work has been done most efficiently and satisfactorily. If the requirements of the service would admit of it, we should have been very glad if you could have been retained in the district, but we wish to

extend to you this acknowledgment of your ability and efficiency and of the many courtesies which you have extended, and with the feeling that in your field you will be eminently successful, we wish for you the greatest measure of success and assure you that our esteem and good will go with you."

SHIP YARD NOTES.

The Queen Anne Railroad & Equipment Co. is having a fine steamer built by the Baltimore Ship Building & Dry Dock Co., Baltimore, Md., to be named Caroline. She is to have a steel hull and will be 200 ft. long over all, 32 ft. beam and 12 ft. deep. The contract speed is to be 16 miles per hour.

Some time in April the keel for a large wooden six-master will be laid in East Boston. The vessel will be named Edward Burgess and is designed by W. Starling Burgess. She will cost Capt. Crandall, her managing owner, \$175,000.

The yacht Pantooet, which the Bath Iron Works is building for Mr. Albert S. Bigelow, is about ready to be launched. She will be 212 ft. in length over all, 175 ft. on the water line, 27 ft. beam and 13 ft. depth.

Capt. C. A. Davis of Somerset, Me., has contracted with the New England Co., Bath, Me., for a three-masted wooden schooner of 142 ft. length, 35 ft. width and 13 ft. depth.

Frank S. Bowker, Philippsburg, Me., will next month begin the construction of a three-masted schooner for Capt. C. A. Small, Machiasport, Me.

Percy & Small, Bath, Me., have about ready for framing the six-masted wooden schooner for J. S. Winslow & Co. of Portland.

The Kelley-Spear Co., Bath, Me., has the keel stretched for a new wooden steamer for the Maine Central Railway.

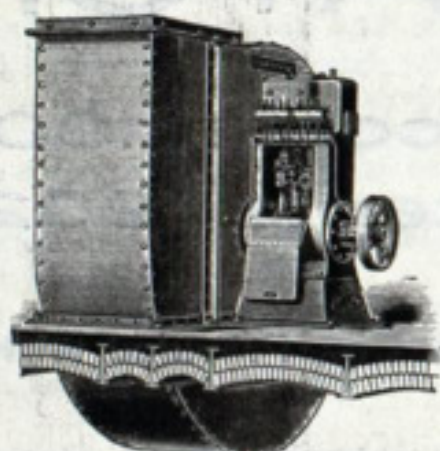
Charles E. White, Everett, Wash., will build a four-masted wooden schooner 230 ft. long for Capt. John Pederson.

Gardiner G. Deering, Bath, Me., is getting out the frame for a large schooner which he will build this season.

A new chart of the Straits of Mackinac, in colors, has just been issued by the United States lake survey office, and can be secured through the Marine Review Pub. Co., Cleveland, Ohio.

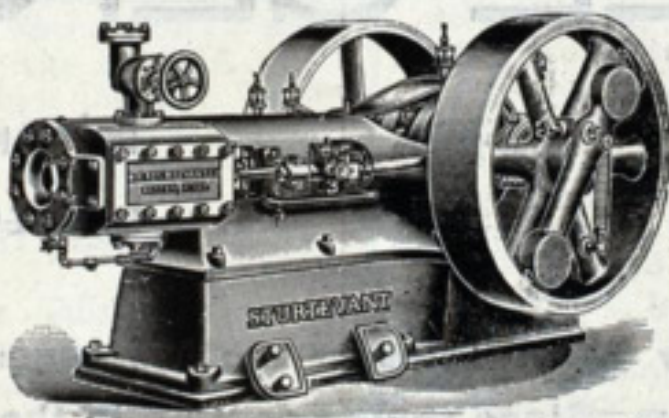
For navigation charts apply to the Marine Review.

STURTEVANT



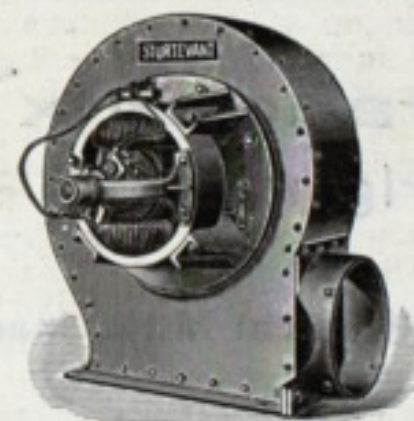
MECHANICAL DRAFT FANS

SAVE COST OF CHIMNEY
INCREASE BOILER OUTPUT
BURN CHEAP FUEL



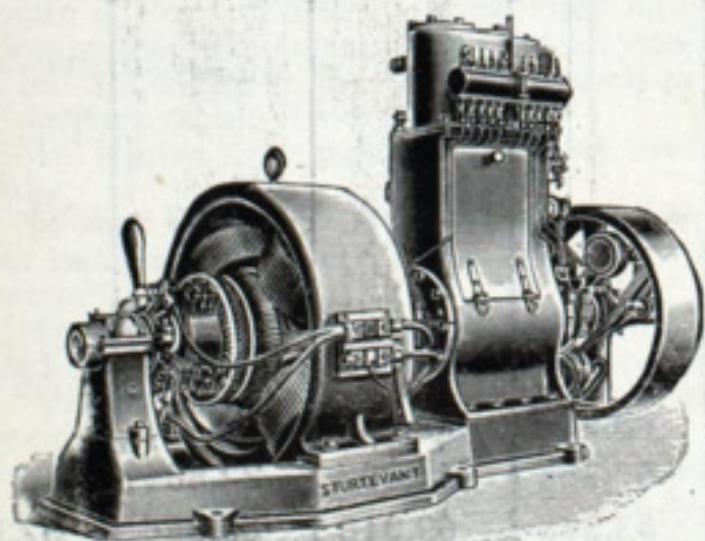
ENGINES

HORIZONTAL AND VERTICAL
115 SIZES BETWEEN 2 AND 250 H. P.
OVER 8,000 IN USE.



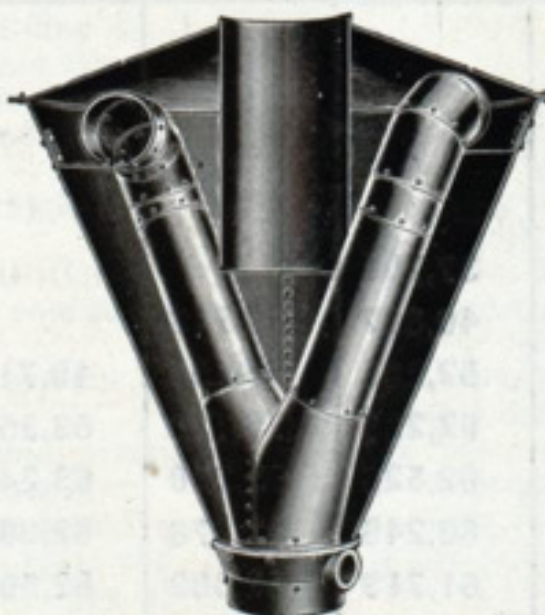
ELECTRIC FANS

BUILT TO MEET ANY REQUIREMENTS IN THE
WAY OF HANDLING AIR, GASES, SMOKE, Etc.



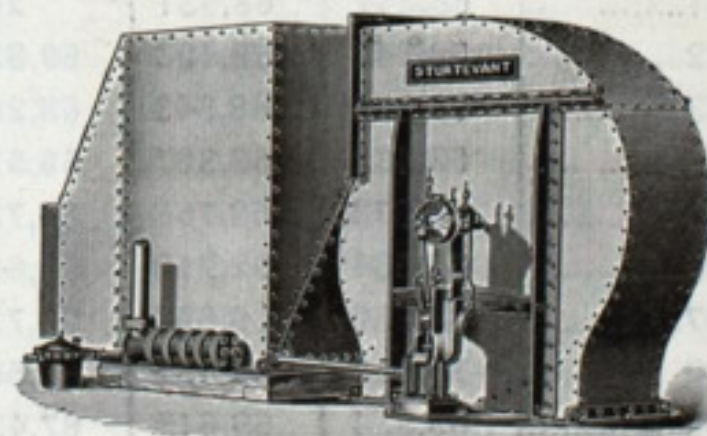
GENERATING SETS

BUILT IN 55 SIZES AND STYLES
BETWEEN 1½ AND 100 K. W.



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BRIDGEPORT STEAMBOAT CO.'S NEW STEAMER.

There was recently launched from the ship yard of the Harlan & Hollingsworth Co., Wilmington, Del., a side-wheel passenger steamer for the Bridgeport Steamboat Co. She is to be known as the William E. Payne and will replace the Rosedale. The new vessel is to be fitted out in a manner suited to first-class service. She will ply between New York and Bridgeport, and as she is designed to make 20 miles an hour she will cover the 60-mile route in three hours. The general dimensions of the Payne are as follows: Length over all, 257 ft.; length, on water line, 240 ft.; beam, at water line, 36 ft., 10 in.; depth, molded amidships at side, 14 ft. 6 in.; draught, 8 ft.

She is intended solely as a day boat, and has ten parlors on the saloon deck. She will accommodate about 1,800 passengers. The crew will be very comfortably housed. Below the main deck a large compartment is fitted up for the use of second-class passengers. The saloons will be exceptionally well lighted, the windows being about double the size of those of an ordinary large observation room, a feature which will be much appreciated. The builders are sparing no expense, as they intend to make her one of the finest day steamers in New York waters.

The engine is of the compound inclined-cylinder direct-acting type, with cylinders of 35 and 72 in. diameter and a stroke of 72 in., with Stephenson link motion. Feathering wheels are used. They are 19 ft. in diameter, with nine buckets 10 ft. 6 in. wide. All necessary fire, bilge, sanitary, donkey pumps, blowers, engine room telegraph, etc., are provided. Four Scotch boilers 10 ft. 6 in. long and 12 ft. in diameter, built for a working pressure of 140 lbs., will furnish steam. There will be a complete electric lighting plant, with a powerful searchlight. The vessel will be running the first week in May.

The Buffalo Forge Co. makes a specialty of down-draft forges and is constantly receiving letters of endorsement regarding their different types of forge. The letters cover a wide range—from the village blacksmith to the heads of railways and great industrial establishments. William Gars-tang, superintendent of motive power for the Big Four railway writes: "Replying to your inquiry in regard to the performance of the down-draft forges designed and furnished for our blacksmith shop at Wabash: These forges were purchased and placed in service in 1895, and since that time they have been entirely satisfactory. We consider the down-draft system an excellent one, first on account of thoroughness in removing smoke from the shop, and second on account of not requiring overhead pipe or other obstructions to interfere with or prevent the handling of heavy work with cranes, etc."

C. H. Westcott, supervising inspector of steam vessels in the Detroit district, has modified the suspension of license suffered by Capt. James F. Foley on account of the burning of the steamer Bon Voyage near Portage on Lake Superior last spring. A suspension ordered by the local inspectors at Marquette would deprive Capt. Foley of the advantage

of his license until May 11 of this year. Supervising Inspector Westcott's modification gives him opportunity to secure a berth on the opening of navigation, as it changes the final date of suspension to March 31.

A particularly useful pump for boiler inspectors, marine engineers and boat owners generally, is that which is made by the Marine Iron Works, station A, Chicago, as illustrated on page 41 of their 1901 catalogue, which is sent free on receipt of request.

Lumber Steamer For Sale.

Capacity about 700 M ft.; also two barges, capacities, respectively, one million and 550 M ft. If interested communicate with L. S. Sullivan, Toledo, O. Apr 5.

Engine, Boilers, etc., For Sale Cheap.

Two Scotch boilers 11x12, 160 lbs. steam. Triple-expansion engine 20, 30 and 54 in. with 40 in. stroke. Shaft, wheel, anchors, chain, etc., from wrecked steamer Fedora. Thoroughly overhauled. Write for particulars. F. L. Gilbert, 301 Torrey Bldg., Duluth, Minn. March 27.

Steamer I. M. Weston For Sale.

Length, 96.5 ft.; breadth, 18 ft.; depth, 7.6 ft.; 95 tons. In first-class condition. E. J. Glackin, 363 So. Morgan street, Chicago. tf

FOR SALE.**Two First-Class Passenger Steamers.**

One side-wheel steel steamer. Length, 201.4 ft.; beam, 32.5 ft.; over all, 56 ft.; depth, 9.4 ft. Hull, machinery and boiler in good condition. Has upper deck with cabin and state rooms; complete outfit and is allowed to carry 1,500 excursion passengers.

One steel propeller. Length, 155 ft.; beam, 30 ft.; depth, 9.7 ft. Hull and machinery in good condition. Has upper cabin and thirty state rooms; complete outfit. Is allowed to carry 500 excursion passengers. Speed, 15 miles per hour.

Apply to the H. W. Williams Transportation Line, South Haven, Mich. tf

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Hors Concours 1900
Latest Patents 1902

Number of Nautical Miles made each year by Steamships of the Messageries Maritimes Co., Provided with Belleville Generators—Since their Adoption in the Service.

Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
1901.....	44,220	69,627	69,594	66,948	51,057	62,460	62,490	61,743	62,688	43,866	62,466	63,126
Total.....	801,723	783,264	714,378	664,371	438,576	418,836	355,173	271,257	234,870	172,596	148,416	115,266

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